CERAMIC ABSTRACTS and THE BULLETIN

AMERICAN CERAMIC SOCIETY

JULY 15, 1942

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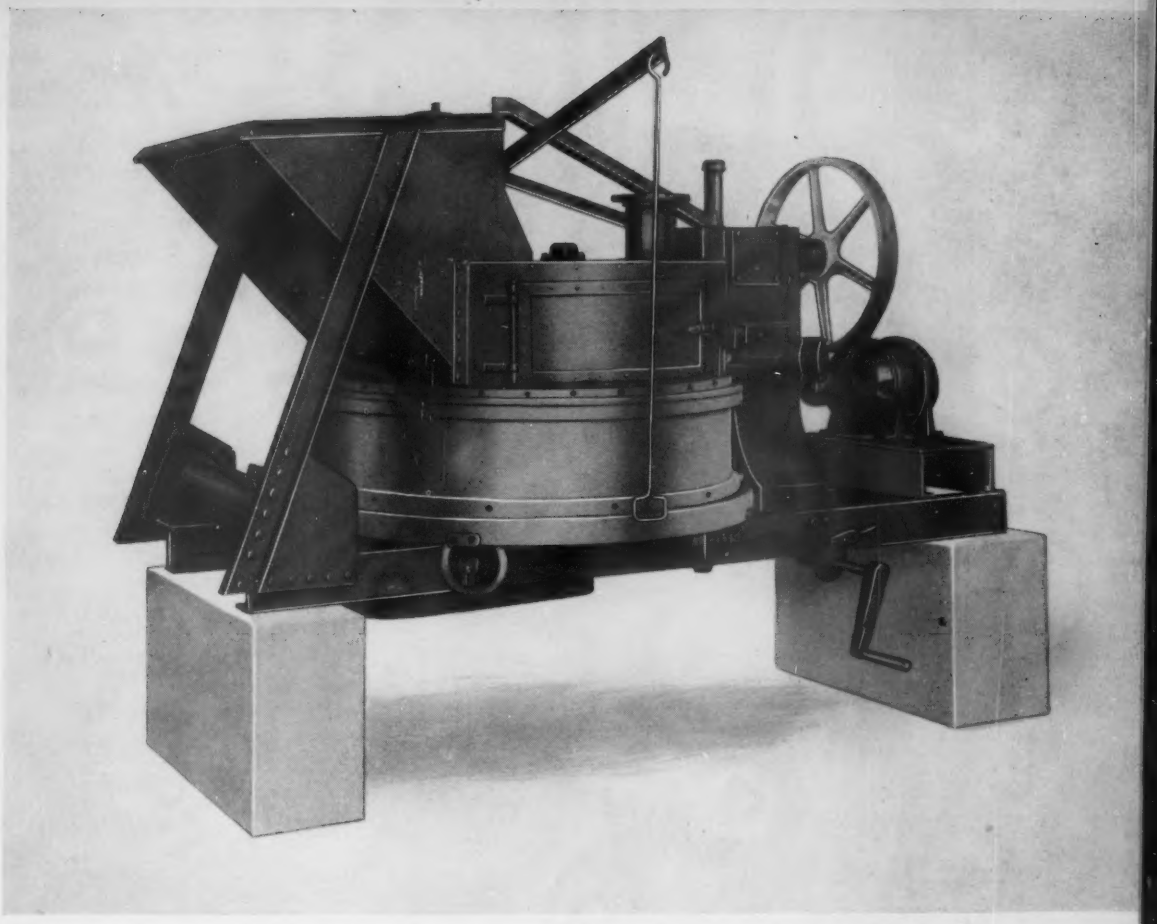

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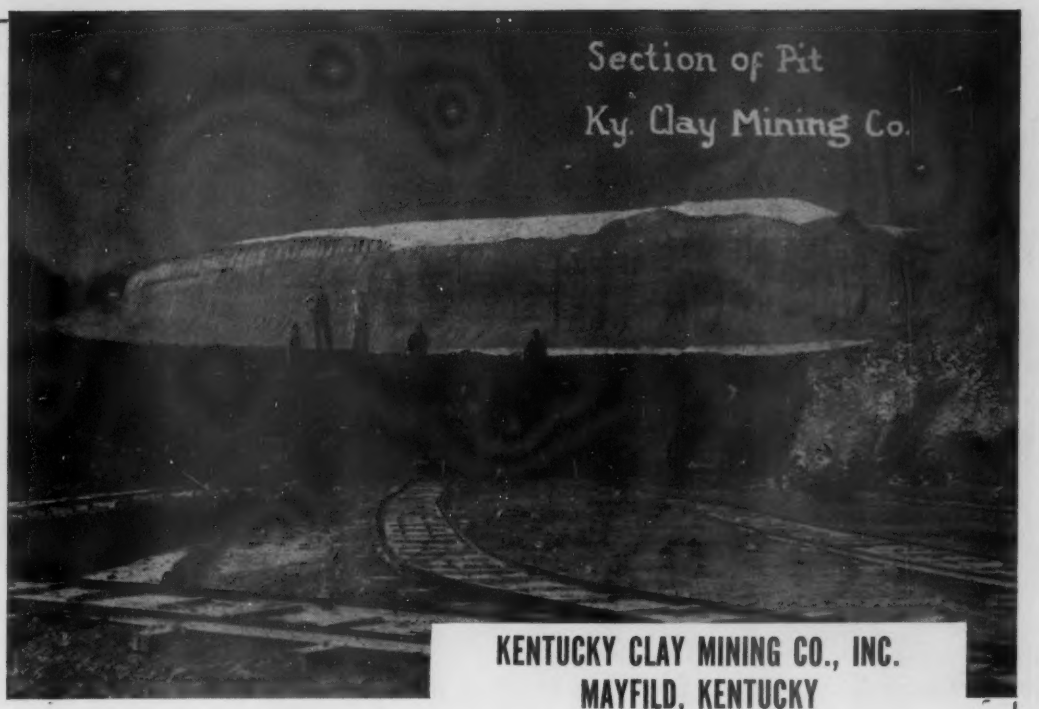

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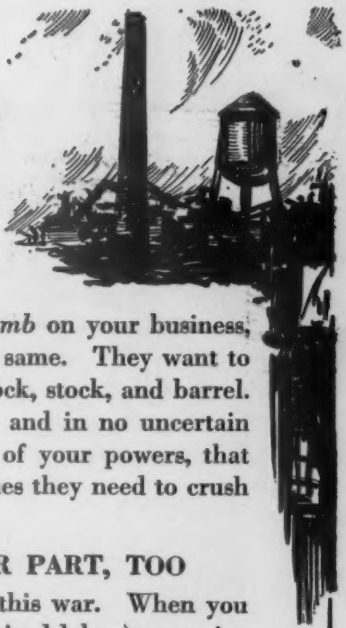

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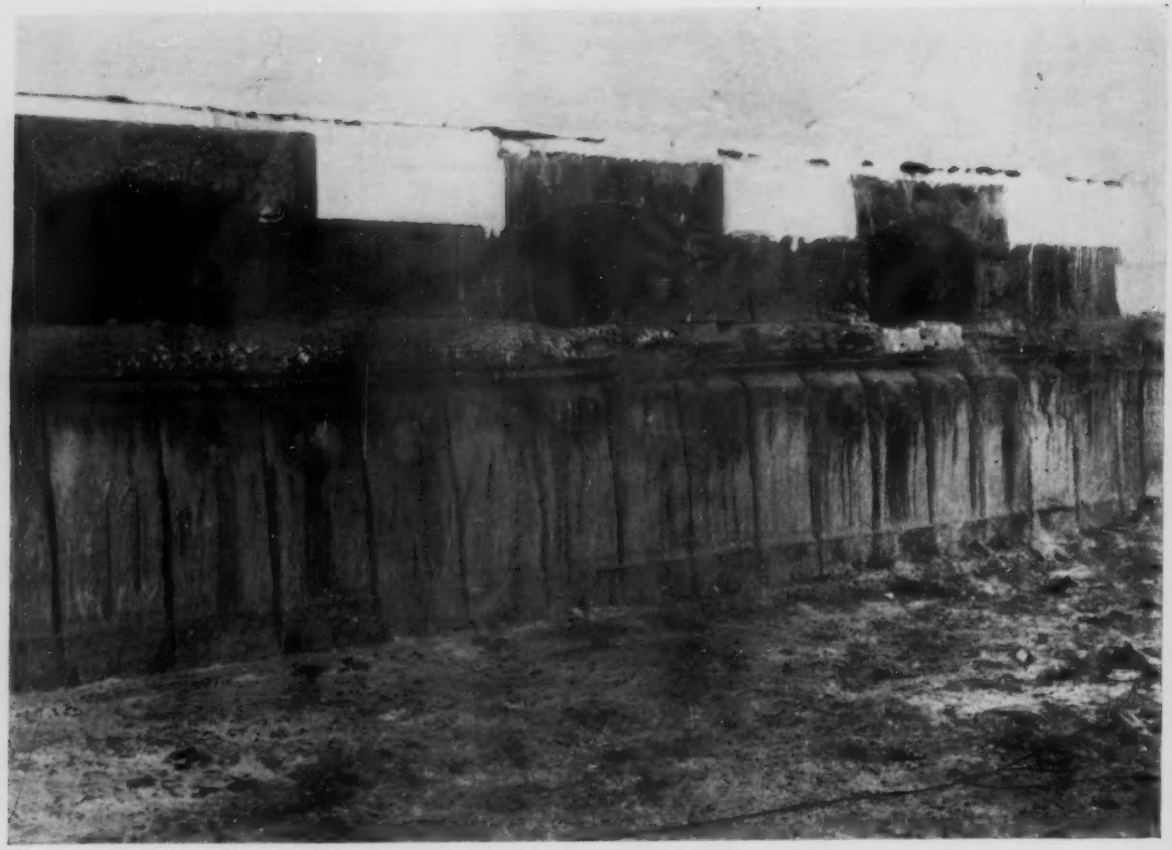

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JOURNAL REFERENCE: The journal name appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).

Vol. 21 **July 15, 1942** **No. 7**

Abrasives

Centerless grinding of high-nickel alloys. JOHN H. JAECKER. *Machinery* [N. Y.], **47** [9] 115–16 (1941).—J. describes the changes involved in shifting from hand to machine grinding of bars of Monel, nickel, and Inconel metals; the problems encountered in removing a large amount of stock from bars of these metals are attributed to the characteristics of the metals, which are given in the following table:

Alloy	Chemical analysis (%)	Tensile strength (lb./in.²)
Monel	65–70 nickel 26–30 copper	80,000–95,000
Nickel	98 nickel	70,000–85,000
Inconel	80 nickel 12 chromium 6 iron	95,000–105,000

The high tensile strengths and the high degree of toughness caused three major operating difficulties: (1) severe metal pickup on the guide blade, (2) rapid breakdown of the face of the grinding wheel, and (3) excessive power requirement. The problems of grinding were solved by the use of a No. 3 Cincinnati centerless grinder having a long-bar fixture with roller guides. It can handle bars $^1/_2$ to 4 in. in diameter and up to 24 ft. long. The grinding wheel is 24 in. in diameter when new and is allowed to wear down to 16 in. in diameter; the surface speeds for these diameters are 6000 and 4700 ft. per min., respectively. A 30-h.p. constant-speed motor is used. The abrasive feed wheel is 14 in. in diameter and is driven by a 1-h.p. motor. The rod being ground is supported between the grinding wheels by a guide blade; the rod is cooled and then cleaned with a solution of 10% water-soluble oil in 90% water. The abrasive wheel must remove 0.02 in. from the diameter of the rod as it passes along at a rate of 300 ft. per hr. The recommended wheels are made of silicon carbide grit with a resinoid bond; the Macklin Co. and the Carborundum Co. both manufacture wheels suited for this difficult grinding task. Figures show the economy of the $90 wheels, which last 60 hr., over hand operations, and a graph of diameter of work vs. rate of feed is given. R.H.B.

Chemical reactions as an aid to machining—influence of solutions of electrolytes on the rate of grinding of metals. A. BEHR. *Metallurgia*, **25** [145] 10–12 (1941).—B. reviews the work of A. G. Samartsev and V. P. Lavrov (*Zhur. Tekh. Fiz.*, **7**, 24–29, 926–30 (1937)), who showed that the energy liberated in chemical reactions, when properly controlled, may be used to improve the efficiency of abrasives used in machining operations. The effects of various electrolytes on the rate and amount of grinding of iron, stainless steel, nickel, silver, copper, and Pobedit are tabulated. B. also mentions briefly the advantages of using reactive gases under appropriate conditions, as in recent Russian work on the grinding of diamonds. E.C.P.

Tool-room grinding. ANON. *Edgar Allen News*, **20** [239] 908–12 (1942).—Tool-room grinding includes accurate grinding of cylindrical parts, gauges and fixtures, and the sharpening of lathe and planer tools and all kinds of cutters and reamers. The special precision machines developed for the many types of grinders are described. Four main types of abrasives are used in grinding wheels: silicon carbide; "green grit" silicon carbide (similar to the regular form except that it is light green instead of black, is quite brittle, and breaks with a sharp fracture); a crystalline form of aluminum oxide (without chemically combined water); and an alumina of very high purity with a porous and more friable structure. Grade is the tenacity with which the cutting particles are held in the body of the grinding wheel under grinding pressure. Tables of grit size and grade scales for vitrified, silicate, shellac, and rubber wheels are given. High-tensile strength materials require an aluminous abrasive, while materials of tensile strengths less than 50,000 lb. per sq. in. (cast Fe, brass, bronze, Al, Cu, etc.) require a silicon carbide abrasive. The harder the material, the softer is the grade and the finer must be the grit of the grinding wheel; for ductile materials, the grit should be coarse. For removing large amounts of stock, the grit should be coarse, the grade hard, and the bond structure dense and tough. The finer the finish required, the finer must be the grit size, although in machine grinding fairly good finishes can be obtained with relatively coarse grits by proper use of the diamond dressing tool together with careful adjustment of work

speeds and wheel speeds. When the arc or area of contact between the wheel and the work is large, the grit size should be coarse, the grade soft, and the bond structure open; the larger the wheel, the greater is the arc of contact. With high wheel speeds and the resulting harder grade action, the grade should be soft. The use of coolants produces finer finishes with the same size of grit in the wheel, and harder grades and higher rates of stock removal are permissible with better economy. The more rigid the machine and spindle, the softer the grade of the grinding wheel should be and the more accurate is the work produced. Standard types of grinding wheels are listed, and methods of dressing and truing them are described. See "Treatise . . .," *Ceram. Abs.*, **20** [2] 37 (1941). M.H.

PATENTS

Abrading machine. LLOYD W. GODDU (American Optical Co.). Can. 403,180, March 3, 1942 (March 16, 1940; in U. S. March 27, 1939). Can. 403,322, March 10, 1942 (March 16, 1940; in U. S. March 27, 1939). G.M.H.

Abrasive article. R. C. BENNER AND R. L. MELTON (Carborundum Co.). U. S. 2,284,715, June 2, 1942 (Jan. 22, 1941).—A flexible abrasive web of felted fibrous materials impregnated with suitable adhesive binder and having abrasive grain distributed internally of the web, the web having an abrasive grain content progressively greater from one surface of the web to the opposing web surface.

Abrasive article. J. P. FENTON (American Sandpaper Co.). U. S. 2,282,650, May 12, 1942 (May 1, 1941).

Abrasive article. W. P. FITZ-RANDOLPH (Carborundum Co.). Can. 403,204 and 403,205, March 3, 1942 (June 26, 1939). G.M.H.

Abrasive device for cleaning still tubes, etc. H. G. WEINLAND (Norton Co.). U. S. 2,283,521, May 19, 1942 (March 2, 1940). U. S. 2,283,522, May 19, 1942 (April 16, 1941).

Abrasive material. EDWARD HURST (United Cotton Products Co.). U. S. 2,284,738, June 2, 1942 (Jan. 22, 1941).—An abrasive article comprising a fibrous web formed from a plurality of carded fibrous membranes the individual fibers of which are interlocked and interwoven forming interstices therebetween and making a substantially unlaminated web structure, the interstices of the web containing included abrasive grains anchored with a suitable adhesive.

Abrasive paper. N. E. OGLESBY (Durex Corp.). Can. 404,364, April 28, 1942 (Sept. 10, 1940). G.M.H.

Blade-grinding machine. HERMANN HILL (Magazine Repeating Razor Co.). U. S. 2,281,975, May 5, 1942 (June 3, 1941).

Bonded-abrasive article. PETER DE LEEUW AND C. E. WOODDELL (Carborundum Co.). Can. 404,084, April 14, 1942 (June 6, 1941). G.M.H.

Camshaft bearing grinding machine. C. G. FLYGARE AND C. C. ALVORD (Norton Co.). U. S. 2,284,606, May 26, 1942 (Oct. 13, 1939).

Centerless grinding machine. AKTIEBOLAGET MALCUS HOLMQUIST. Brit. 544,509, April 29, 1942 (June 16, 1939).

Coating for abrasives. R. P. CARLTON AND T. J. MILLER (Minnesota Mining & Manufacturing Co.). Can. 403,971, April 7, 1942 (Jan. 30, 1936). G.M.H.

Cylindrical grinding machine. C. G. FLYGARE AND S. S. MADER (Norton Co.). U. S. 2,281,930, May 5, 1942 (March 4, 1941).

Device for feeding rods or tubes in grinding machines, etc. J. E. BERGSTRÖM. U. S. 2,284,257, May 26, 1942 (Dec. 21, 1939).

Feeding devices for grinding machines. AKTIEBOLAGET SVENSKA KULLAGER-FABRIKEN. Brit. 544,687, May 6, 1942 (Dec. 13, 1939).

Grinding and lapping machine. R. A. COLE (Norton Co.). U. S. 2,283,792, May 19, 1942 (Aug. 24, 1940).

Grinding machine. J. I. GARSIDE (Norton Co.). U. S. 2,284,050, May 26, 1942 (June 19, 1940). H. A. SILVEN (Norton Co.). U. S. 2,284,073, May 26, 1942 (March 27, 1940).

Grinding ring. EDWARD VAN DER PYL (Norton Co.). Can. 404,899, May 19, 1942 (Sept. 3, 1940; in U. S. Sept. 5, 1939). G.M.H.

Grinding wheel. EDWARD VAN DER PYL (Norton Co.). Can. 404,900, May 19, 1942 (Sept. 9, 1940; in U. S. Sept. 11, 1939). Can. 404,901, May 19, 1942 (Sept. 19, 1940; in U. S. Sept. 21, 1939). G.M.H.

Grinding wheel. S. S. KISTLER (Norton Co.). U. S. 2,282,192, May 5, 1942 (April 29, 1940).—An abrasive body comprising abrasive grains united by shellac and 5 to 75% on the total bond weight of a resin which is the reaction product of polyhydric alcohol and polybasic acid, the sum of the primary hydroxyl groups on the alcohol molecule plus the carboxyl groups on the acid from which the resin is derived being not less than five, there having been at least substantially an equivalent amount of acid to react with the alcohol.

Grinding wheel. EDWARD VAN DER PYL (Norton Co.). U. S. 2,282,912, May 12, 1942 (Sept. 11, 1939).

Grinding-wheel dresser. H. N. SEYFERTH AND I. J. SNADER (Ex-Cell-O Corp.). U. S. 2,281,719, May 5, 1942 (July 26, 1938). I. J. SNADER (Ex-Cell-O Corp.). U. S. 2,281,723, May 5, 1942 (July 26, 1938; Dec. 16, 1940).

Grinding wheel and its manufacture. NORTON GRINDING WHEEL CO., LTD. Brit. 544,538, April 29, 1942 (June 5, 1940).

Grinding-wheel and truing-mechanism feed. R. E. FLANDERS (Jones & Lamson Machine Co.). U. S. 2,284,954, June 2, 1942 (Aug. 17, 1940; June 12, 1941).

Hone. H. G. WOMMER (Keystone Reamer & Tool Co.). U. S. 2,283,132, May 12, 1942 (Sept. 19, 1940).

Honing device. K. W. CONNOR (Micromatic Hone Corp.). U. S. 2,284,134, May 26, 1942 (April 27, 1936).

Honing machine. J. E. KLINE (Micromatic Hone Corp.). U. S. 2,284,325, May 26, 1942 (Nov. 27, 1939).

Inserted tooth abrasive wheel. EDWARD VAN DER PYL (Norton Co.). Can. 404,902, May 19, 1942 (Sept. 19, 1940; in U. S. Sept. 21, 1939). G.M.H.

Lapping machine. H. S. INDGE (Norton Co.). U. S. 2,284,056, May 26, 1942 (July 9, 1940).

Lens-edging machine. E. M. LONG (Shuron Optical Co.). Can. 403,532, March 17, 1942 (May 29, 1939; Oct. 2, 1940). G.M.H.

Machine for lapping the ways of machine tools. H. S. INDGE (Norton Co.). U. S. 2,282,145, May 5, 1942 (Aug. 17, 1939).

Manufacture of abrasive articles. R. C. BENNER AND R. L. MELTON (Carborundum Co.). U. S. 2,284,716, June 2, 1942 (Jan. 22, 1941).

Manufacture of abrasive articles and apparatus therefor. B. S. CROSS (Minnesota Mining & Mfg. Co.). U. S. 2,281,558, May 5, 1942 (March 6, 1933).

Manufacture of abrasive materials. EDWARD HURST (United Cotton Products Co.). U. S. 2,284,739, June 2, 1942 (Jan. 22, 1941).

Method and apparatus for lapping piston rings. J. S. TURNBULL AND METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 544,503, April 29, 1942 (Jan. 6, 1941).

Reciprocating machines for grinding screw threads, etc. H. F. ATKINS. Brit. 544,575 and 544,576, April 29, 1942 (Dec. 20, 1940).

Sanding or polishing pad. G. E. SMITH (U. S. Electrical Tool Co.). U. S. 2,281,722, May 5, 1942 (Nov. 20, 1939).

Surfacing machine. J. C. INMAN (Lempco Products, Inc.). U. S. 2,285,377, June 2, 1942 (June 27, 1939).

Tailstocks for precision grinding machines or lathes. J. LUND, LTD., AND J. D. SCAIFE. Brit. 544,194, April 15, 1942 (Oct. 14, 1940).

Wood-grinding machine. F. W. ROBERTS. U. S. 2,282,887, May 12, 1942 (Dec. 30, 1938).

Work-gauging instrument for precision grinding machines. H. H. ASBRIDGE (Churchill Machine Tool Co., Ltd.). U. S. 2,281,817, May 5, 1942 (March 31, 1941).

Art and Archeology

Ancient Ostia. ALINE ABAECHERLI BOYCE. *Sci. Amer.*, **166,** 70–72 (1942).—The part being excavated was built during the 2d, 3d, and 4th centuries A.D. and was the seaport of Rome. There are market buildings, shops, apartment houses, homes, inns, statuary, and inscriptions. The streets are of brick. Many mosaic floors were found in the buildings. W.D.F.

Ceramic lithography in sharp-fire colors and underglaze colors. ANON. *Keram. Rundschau*, **47,** 491–92, 508–10, 536–38 (1939); abstracted in *Chem. Zentr.*, **1941, I,** 1585.—A discussion is given of the use of lithography for sharp-fire decorating, photolithography, the manufacture of transfer paper for printing pictures for sharp-fire and underglaze colors, color preparations for ceramic prints made by lithography, glaze frits for whiteware, and hand-lever lithograph presses. M.V.C.

Development of an art program at an NYA resident project. JACK M. SMOOT. *Bull. Amer. Ceram. Soc.*, **21** [5] 76–78 (1942); see *ibid.*, **20** [1] 11–13 (1941).

Masterpieces of Saxon pottery. ALBERT SCHRÖDER. *Sprechsaal*, **73** [49] 449–51 (1940).—Pottery making is an old art in Saxony, and the ware produced is among the best of German art. Figures of the Emperor Heinrich II and the Empress Kunigunde from the church in Rochlitz date from 1476, which is significant because statues of pottery were then a novelty. The façade from the former Dominican church in Leipzig is the only example of façade ceramics of the late Gothic period. The "hedgehog" vase in the Leipzig museum is about 50 cm. high. It is remarkable from a technical viewpoint, as the base is perforated with triangular openings, and at the top of the base are three lugs with movable rings through them. There were many notable potters in the 16th century. The first work of this period, the most significant ever produced in Saxony, is the earthenware pulpit in the church at Strehla, made in 1565. The pulpit rests on a life-size figure of Moses, fired in three pieces. The eight sides of the pulpit are adorned with biblical reliefs, each made in one piece. The work was done by a 24-year-old potter, Melchior Tatzen. The ability of the potter Martin Koller is demonstrated by a jug in the Dresden museum, made in 1569, which should be considered as a forerunner of the well-known Nürnberg ware. Koller was a teacher of great influence whose works furnished inspiration for many others. Even a century later, Christoph Niesl used the same branches and roses in decorations. In 1575 Hans Elsesser designed a memorial tablet 3 m. high in the Marien church at Zwickau, which is probably the only ceramic memorial in Saxony. It was painted with wax colors after firing. Saxony is less fortunate than southern Germany, where beautiful tile stoves from the Gothic period may still be found. Many mentioned in literature can no longer be found in Saxony. One of the oldest examples still in existence is from the Marien church; it has a green glaze, with a colored frieze on the upper and lower halves. It also is the work of Hans Elsesser. W.H.H.

PATENTS

Bottle. LESTER L. LEWIS (Howard V. Bonsal). Can. 403,697, March 24, 1942 (Oct. 24, 1941; in U. S. May 10, 1941). G.M.H.

Decalcomania. C. B. WILKERSON (Davis, Lindsey, Smith & Shouts). U. S. 2,283,480, May 19, 1942 (Jan. 19, 1940).

Decalcomania paper. LEWIS DAVIS AND EDWIN C. TUUKKANEN (McLaurin-Jones Co.). Can. 404,407, April 28, 1942 (June 26, 1940; in U. S. Aug. 10, 1939). G.M.H.

Designs for:

Candle holder. C. W. SAWYER (Libbey Glass Co.). U. S. 132,565, May 26, 1942 (Sept. 25, 1941).

Candy jar. C. W. SAWYER (Libbey Glass Co.). U. S. 132,285, May 5, 1942 (Sept. 25, 1941).

Dish. G. E. GREGORY (Oneida, Ltd.). U. S. 132,344, May 12, 1942 (Aug. 29, 1941).

Jar. C. W. SAWYER (Libbey Glass Co.). U. S. 132,284, May 5, 1942 (Sept. 25, 1941).

Plate. VIKTOR SCHRECKENGOST (Limoges China Co.). U. S. 132,601, June 2, 1942 (Dec. 17, 1941).

Urn. E. W. FUERST AND C. W. SAWYER (Libbey Glass Co.). U. S. 132,522, May 26, 1942 (Sept. 25, 1941).

Vase. E. W. FUERST AND C. W. SAWYER (Libbey Glass Co.). U. S. 132,359, May 12, 1942 (Sept. 25, 1941). C. W. SAWYER (Libbey Glass Co.). U. S. 132,264, May 5, 1942 (Sept. 25, 1941). U. S. 132,559 and 132,560, May 26, 1942 (Sept. 25, 1941).

Vitrifiable composition for decorating glassware. A. J. DEYRUP (E. I. du Pont de Nemours & Co.). U. S. 2,282,540, May 12, 1942 (June 30, 1941).—A low-melting vitrifiable flux suitable for application to glassware of low expansion characteristics, the flux having substantially the following composition: lead oxide 21.0 to 32.5, zinc oxide 30.0 to 41.5, boric oxide 21.0, silica 8.5, sodium oxide 2.5, cadmium oxide 4.0 and titanium dioxide 1.5%, the lead oxide and zinc oxide content totaling together 62.5%, all the percentages being by weight based on the total weight of the flux.

Cements

PATENTS

Gypsum plaster. DEAN D. CRANDELL (National Gypsum Co.). Can. 404,412, April 28, 1942 (Jan. 6, 1941). G.M.H.

Preparing calcined gypsum. O. F. REDD. U. S. 2,282,091, May 5, 1942 (Oct. 17, 1938).

Enamel

Crazing and hairlines in boron-free sheet-metal enamel. ANON. *Sprechsaal*, **73** [46] 413–15 (1940).—Enamel containing boron showed some crazing, but it was not a serious matter and the purchaser made few complaints. With boron-free enamel, the crazing is more serious; it occurs in enamel on both cast iron and sheet metal. Crazing causes real cracks in the enamel layer, while hairlines are cracks which have been fused. The former do not appear until the ware is finished, but the latter occur in the furnace. Crazing occurs in lead-free majolica enamel but seldom in wet enamel on cast iron. Hairlines occur frequently in sheet-metal enamel and wet enamel, especially with acid-proof enamel. Crazing can be seen more readily if dust is rubbed on the ware, but this is no help in the case of hairlines. In many boron-free sheet-metal enamels, crazing is so noticeable that the quality of the ware appears poor. With these enamels, the required difference between the coefficients of expansion of the sheet metal and of the enamel can be previously controlled to prevent crazing. The use of too much soda, as a substitute for borax, easily causes the expansion of the enamel to approach too closely that of the sheet metal. The substitution of fluorspar for an equal amount of soda has been found to prevent crazing. Crazing is especially dangerous if it occurs in the ground coat as well as in the cover coat. A mysterious case of crazing of sheet-metal enamel was finally proved to be due to improper melting of the boron-free enamel. The high viscosity of this enamel, which is increased by opacifiers,

makes it difficult to estimate the melting point accurately. The enamel of the ground coat causes less difficulty because it does not contain opacifiers. There are several main groups of borax substitutes: (1) crude materials, such as soda, fluorides, phosphates, etc.; (2) frits, e.g., enamelers' glass powder, and other borax substitutes; and (3) substitutes which are mixtures of crude and melted materials. Materials of group 2 are recommended, and they cost no more than borax. Hairlines are found frequently in acid-proof enamels. They occur more often in the cover coat than in the ground coat. The thicker the enamel layer, the more clearly are the hairlines visible, and as the ground coat is thinner than the cover coat, the hairlines are more easily and more often seen in the latter. Visibility also depends upon color. Crazing spreads from one layer to another, but hairlines do not, and a second layer may be placed on a coating showing hairlines. They are thus less serious than crazing, and this should be explained to the purchaser. See *Ceram. Abs.*, **21** [5] 98 (1942). W.H.H.

Effect of dipping angle on the weight of enamel retained. E. E. Howe. *Better Enameling*, **13** [2] 3–6 (1942).—H. investigated the relation between the angle of drain and the picking-up of enamel. As the angle of drain decreases toward 45° the amount of enamel picked up increases, but not in a straight-line relationship, the face side being affected more than the back side. Tests confirmed the practice of immersing fabricated parts face down to reduce burn-off and copperhead tendency on the back, as ware which was slid out of the bath at a 45° angle face side down retained appreciably more enamel on the back side than on the face side. B.C.R.

Electrolytic cleaning of metals. Herbert R. Hanley. *Metal Progress*, **41** [2] 179–83 (1942).—Metal surfaces may be cleaned to remove the oxide coat by sandblasting, grinding, HCl or H_2SO_4 attack, or cathodic or anodic electrolysis in a suitable electrolyte. In cathodic cleaning, the rate of penetration of hydrogen increases with increasing current density, resulting in increased hardness, termed "hydrogen embrittlement." Ordinary H_2SO_4 also develops this type of hardness but at a slower rate. HCl does not cause embrittlement. In anodic cleaning, there is no hydrogen atmosphere and hence no embrittlement. The theory and the history of inhibitors, organic or inorganic, are discussed. Organic inhibitors affect the reactions at negatively charged areas, whereas inorganic inhibitors, such as arsenates, phosphates, silicates, and chromates, inhibit the reactions at positively charged areas. Inhibitors reduce the amount of atomic hydrogen diffusing through the metals. Spheroidized cementite permits a higher rate of diffusion of hydrogen than lamellar pearlite. B.C.R.

Enameled steel acid-resistant machines in the canning industry. V. I. Savchenko. *Konservnaya & Plodoovoschnaya Prom.*, **1939,** No. 4, pp. 37–40; *Khim. Referat. Zhur.*, **1940,** No. 1, p. 141; *Chem. Abs.*, **36,** 1453 (1942).—The chemical stability of the enamels is determined (*a*) by the "grain" method and (*b*) by testing the finished product. In *a* the grains of the enamel glass are heated with HCl and organic acids of various concentrations at 100°. Method *b* consists in boiling a 20% HCl solution in the apparatus. Armco steel is recommended for the machines. The machines were also made from the 1008 steel containing C 0.06 to 0.12, Mn 0.30 to 0.60, Si traces, P 0.035 (max.), and S 0.035% (max.).

Heating open tanks by submerged combustion. Walter G. See. *Ind. Heating*, **7** [7] 604, 606, 608 (1940).—S. describes a heating system for pickling baths in which the gas burners are submerged in the solution and the latter is aerated by the compressed air used in the combustion of the gas; this aeration accelerates the pickling. The products of combustion are conducted by pipes to and across the bottom of the pickling tank where they are allowed to escape; these products of combustion, together with the aerating air, thoroughly agitate the solution. This method of heating has several advantages over open steam jets: the solution is not diluted, and the amount of acid used is considerably smaller (40 to 60%). In one case, the total acid consumption in the pickling of steel bars was reduced from 54 to 21.8 lb. per ton. The arrangement of the combustion plant and its automatic control are described in full. M.H.

Should enamelers convert for heat-treating? Anon. *Better Enameling*, **13** [3] 6–8 (1942).—The factors, both economical and mechanical, involved in the conversion of enameling furnaces for heat-treating either ferrous or nonferrous materials are discussed. See "England's...," *Ceram. Abs.*, **21** [5] 99 (1942). B.C.R.

Titanium dioxide and its influence in enamels, glasses, and glazes: I, Introduction and general part. R. Boncke, A. Dietzel, and W. Pralow. *Sprechsaal*, **74,** 295–97, 303–304, 311–12 (1941); *Chem. Abs.*, **35,** 7672 (1941).—A review is presented of the investigations on the chemistry of Ti, the systems with TiO_2, the structural chemistry of the titanates, the properties of the TiO_2 modifications, the occurrence of Ti, the technical production of TiO_2, and its applicability. **II, Experiences with the influence of titanium dioxide in enamels and glasses.** *Sprechsaal*, **74,** 372–76 (1941); *Chem. Abs.*, **35,** 8230 (1941).—In enamels, TiO_2 increases the chemical resistance and the brightness and acts as a fluxing agent. Opacification with TiO_2 only is not always sufficient and in most cases is yellowish. In glasses, TiO_2 increases n, and there is absorption in the long ultraviolet. TiO_2 decreases the viscosity and surface tension.

Zircon enamel frits. Glen B. Fulton. *Ceram. Ind.*, **37** [6] 78, 80 (1941).—Zircon-opacified enamels give better coverage with thin coatings and simplify reclaim and color-matching problems. Illustrated. H.T.

PATENTS

Casting of vitreous material. British Thomson-Houston Co., Ltd. Brit. 544,512, April 29, 1942 (Oct. 13, 1939); addition to 508,295, July 12, 1939 (Feb. 1, 1938).

Making sinks. V. J. Graf (Steel Plumbing Wares, Inc.). U. S. 2,282,571, May 12, 1942 (Sept. 20, 1937).

Glass

Bubbles and stones in glass. P. *Keram. Rundschau*, **45** [42] 481–82 (1937).—Gas bubbles in glass are produced by ingredients of the frit which are slow to dissolve or from refractory material dissolved in the glass from pots or tank blocks. If no reaction gas is detected in the bubbles, the defect can be attributed to defects in the block or pot. M.V.C.

By what can alkalis (soda and potash) and some coloring oxides be partly replaced in the glass batch. V. Čtyroký and Z. Schaefer. *Sklářské Rozhledy*, **17,** 50–52 (1940); abstracted in *Chem. Zentr.*, **1940, II,** 2361.—The possibility of replacing alkalis by phonolite, granite, basalt, feldspar, or lepidolite in the manufacture of glass was investigated, and compositions of batches made with phonolite and with granite and the glasses resulting are discussed. The minerals mentioned cannot be used for crystal glass because of their high Al_2O_3, Fe_2O_3, and FeO content. Blast-furnace slag can be used for colored bottle glass. M.V.C.

Colored glass—green color. Bruno Schweig. *Glass*, **19** [1] 8–10 (1942).—Batch compositions for the production of green glasses are given using (1) chromium compounds for lime and lead glasses, (2) copper, (3) uranium, and (4) vanadium. *Ibid.*, [2] 34–35.—S. discusses green glasses containing praseodymium and those with high borosilica content. The light-transmission values of differently colored glasses are given. **Blue color: I.** *Ibid.*, [3] 62–63, 71.—Several batch compositions for blue glasses using copper or cobalt are given. See *Ceram. Abs.*, **21** [6] 120 (1942). B.C.R.

Crystal-chemical view of the constitution of glasses. A. DIETZEL. *Naturwissenschaften*, **29**, 81–82 (1941); *Chem. Abs.*, **35**, 7258 (1941).—The principal difference between a glass and a crystal is that the ion groups are arranged in different degrees of order, not that these groups are different in themselves. Two cases of coordination changes of ions taking place in crystals as well as in glasses are distinguished. In the first case, a saturated coordination changes to an unsaturated one; thus a decrease in the negative field around the cation is allowed. If colored ions are involved, this change causes a shift toward longer wave of the absorption edge. An example is (CuO_6) to (CuO_4), blue to yellow-brown. The second case is a change from a higher saturated coordination to a lower saturated one with increase in negative field around the cation. The absorption edge shifts toward shorter wave. An example is (FeO_6) yellow to (FeO_4) colorless (ultraviolet absorption).

Effect of different decolorizing agents on the stability of decolorized glasses. O. PŘIDAL. *Sklářské Rozhledy*, **17**, 129–34 (1940); abstracted in *Chem. Zentr.*, **1941, I**, 1860.—Fourteen different glasses were smelted with and without the addition of decolorizing agents, and the effect of exposing them to sunlight for 1200 hr. and to the radiation of a Hanauer quartz lamp for 100 hr. was determined. While sunlight colors plate glass pale yellow and glasses containing Ce, As, and Se a strong yellow-brown, the quartz lamp produced a thin gray-brown surface layer on all glasses free from Pb (Fourcault glass became gray-violet). The coloring can be removed by heating to 200° to 220° (400° for Fourcault glass). Pb glasses are unchanged by light from a quartz lamp. M.V.C.

Effect of tin in gold ruby glass. F. M. VEAZIE AND W. A. WEYL. *Jour. Amer. Ceram. Soc.*, **25** [10] 280–81 (June, 1942).

Experiments on the substitution of potash in an alkali-lead oxide-silica glass for electric lamp purposes. J. H. PARTRIDGE. *Jour. Soc. Glass Tech.*, **25** [109] 151–58T (1941).—The object of the experiment was to reduce the potash content of a lead glass used for sealing the current-carrying leads to the outer envelopes of electric lamps and other electrical devices without reducing its specific electrical resistance. Laboratory melts and commercial melts were considered in relation to a widely known parent glass. Glass containing more soda but substantially less potash than the parent glass can be made as resistant electrically by an addition of small proportions of lime and strontia. Glasses possessing excellent working properties were produced by an addition of 2% lime together with small amounts of either boric oxide, baryta, or strontia; the barium glass had a lower resistance than the strontium glass. Strontia was found to be desirable for a lower alkali content without an increased viscosity. Strontia glasses were less corrosive on pot-clay refractories than baryta glasses. R.H.B.

Glass used to cushion concussion from bombs. ANON. *Science News Letter*, **41** [19] 297 (1942).—A new blast-cushioning, noncombustible material composed of fine resilient glass fibers compressed and treated with a binder has sufficient rigidity to serve as a fibrous, self-supporting, fire-resistant material. It is produced by the Owens-Corning Fiberglas Corp. G.A.K.

Laboratory method for manufacturing glass wool. IKUTARŌ SAWAI AND MASAO MINE. *Science* [Japan], **11**, 302 (1941); *Chem. Abs.*, **35**, 7667 (1941).—A simple method is described for making a small quantity of very fine glass wool. Glass is pushed into and shaved by a grinder with a fused alumina disk (9 mm. wide, 23 cm. in diameter, 1710 r.p.m.). A part of the glass melts, owing to frictional heat, and is lengthened by centrifugal force to fibrous form. As the powdered glass is heavy, it is scattered in a direction tangential to the disk, and the light fibrous glass rotates along the edge of the disk and is accumulated when the surface of the glass mass is sufficiently wet. The glass wool obtained has a fineness of 0.3 to 3.0 μ and a length of up to 3 cm.

Longer service from glasshouse refractories: III. ANON. *Ceram. Ind.*, **37** [6] 58–72 (1941).—The selection of refractories for melter and refiner, throat and bridge wall, neck and floaters, tuckstones, shadow wall, side and end walls, crown, burner ports, regenerators, and recuperators is dealt with. Compositions of glass pots and their properties and services are discussed. A bibliography on glasshouse refractories is included. Illustrated. For Parts **I** and **II** see *Ceram. Abs.*, **21** [1] 9 (1942). H.T.

Physical properties of glasses: I. J. M. STEVELS. *Rec. Trav. Chim.*, **60**, 85–86 (1941); *Chem. Abs.*, **35**, 8226 (1941).—The volume, V, of different glasses can be described by the equation $V = V_0/(1-RX)$ in which R is the ratio of the O atoms to the total number of atoms of the glassforming elements (Si, B, Al, P, etc.); V_0 (a constant) is the volume of an amount of glass containing 1 gm. atom of O for $R \rightarrow 0$; X, a constant, is connected with the extent to which the O network is contracted by the different glass formers. The formula of Huggins ("Density . . . ," *Ceram. Abs.*, **20** [2] 41 (1941)) and this formula differ greatly; one thing they have in common is the idea that V can be expressed as a function of the ratio of the number of O atoms to the number of atoms of other elements present.

Present status of 200-in. telescope mirror. J. A. ANDERSON. *Sci. Amer.*, **166**, 46–48, 106–108 (1942).—The mirror was cast with a continuous front and a series of ribs and circular holes in the back for support. To grind the back, wooden tables were fitted in each opening 2 in. short of being flush, and this space was filled with plaster of Paris. After the back was ground and the plaster cleaned out, the disk was turned over for grinding the front. Bad fractures were removed by sandblasting. The deepest hole was 5 in.; fortunately, this was near the center. Two inches of glass were ground off over the whole front, leaving 4 in. instead of the planned 6 in. The edges were ground with the mirror face down, the 40-in. central hole was cut, and then the holes for the supports were accurately ground. The disk was put on its back on sponge rubber, and a glass plug was put in the central hole and cemented. The supports, which had been removed while the mirror was worked on, were installed carefully. The curve was then roughed out, and an approximately correct curve was made. This was polished. Tests with the mirror on edge showed a zone of vertical astigmatism with a shorter focus, about 0.04 in. shorter than the horizontal plane. This remained vertical as the mirror was turned. It was caused by a slumping of the mirror due to the support of each section not coinciding with its center of gravity. Twelve gravity-operated "squeeze levers" were installed to overcome this defect. The mirror had a satisfactory spherical surface in Aug., 1941, of a radius of 1335.7 in., and parabolizing is now in progress. See "Two . . . ," *Ceram. Abs.*, **21** [1] 10 (1942). W.D.F.

Pyrolusite in the glass industry. Z. *Keram. Rundschau*, **45** [27] 297–98 (1937).—The use of pyrolusite in the glass industry is now confined to the decolorization of crystal glass and to coloring bottle glass olive-green and other glass violet. Yellow, brown, red-brown, and black glasses can be obtained by other coloring substances in Germany. M.V.C.

Quantitative spectrochemical analysis of boric oxide in glass: II. KENZO HARAI. *Jour. Chem. Soc. Japan*, **60**, 1159–60 (1939); *Chem. Abs.*, **34**, 1827 (1940).—The presence of a small quantity of PbO does not affect the result of the analysis. For Part **I** see *Ceram. Abs.*, **20** [4] 90 (1941).

Red silver glasses. EDWARD FORST, JR., AND NORBERT J. KREIDL. *Jour. Amer. Ceram. Soc.*, **25** [10] 278–80 (June, 1942).—4 references.

Relation between expansion coefficient and structure of glasses. A. DIETZEL. *Glastech. Ber.*, **19**, 319–25 (1941); *Chem. Abs.*, **36**, 1150 (1942).—The greater the contribution of an oxide to the total expansion of a glass, the smaller is the electric force of the cation. The apparent anomalies, especially of the alkali-rich glasses, e.g., negative expansion coefficient of Ca and TiO_2, are explained in analogy to B_2O_3.

Smelting glass with common salt. W. ERLANDT. *Novosti Tekhniki*, **9** [15] 32–33 (1940); abstracted in

Chem. Zentr., **1941, I,** 1719.—A glass was produced experimentally as follows: The raw material, pressed in briquettes and composed of all the ingredients except the alkalis, was placed in a shaft kiln. Under it, the NaCl was heated by a "flameless" illuminating-gas fire; the NaCl sublimated and was drawn up through the briquettes. The water vapor generated at the same time split the salt into Na_2O and 2HCl. The Na_2O deposited on the pressed pieces, and the HCl was drawn off with the combustion products and collected. The glass was then smelted in an adjoining refining chamber. If any Fe is present in the raw materials, it forms volatile chlorine compounds with the escaping HCl, so that the glass remains colorless.

M.V.C.

Striae observed in optical glass. HIROSI KUBOTA. *Bull. Inst. Phys. Chem. Research* [Tokyo], **20,** 370–83 (1941) (abstracts (in English), p. 30 (in *Sci. Papers Inst. Phys. Chem. Research* [Tokyo], **38,** Nos. 1034–35)); *Chem. Abs.*, **36,** 1151 (1942).—Various kinds of striae (parts having different indices of refraction from that of the surrounding glass) in optical glass were photographically observed by means of the Twyman type of the Michelson interferometer. Besides common linear striae, 2- and 3-dimensional and complex striae were also revealed.

Substitutes in the glass industry. A. FOULON. *Glashütte,* **71** [1] 7–8 (1941).—In the manufacture of hardened glass with low silicic acid content, the boric acid is replaced by oxides of Mg, Ca, Zn, or their mixtures. The Pb content in glasses for electrotechnical purposes is replaced by BaO and ZnO. The oxides named are also used to replace boric acid in the ceramic and enameling industries. ZnO is not poisonous.

M.V.C.

Variation with temperature of the spectral transmission of glasses: I, Transmission in the visual spectral region at temperatures from 20° to the softening point. A. J. HOLLAND AND W. E. S. TURNER. *Jour. Soc. Glass Tech.*, **25** [109] 164–220T (1941).—To explore the distribution of temperature at different points in a mass of molten glass within a furnace, an indirect spectrophotometrical method of analysis was devised; the operating principle depends upon the absorption of radiation of different wave lengths on its passage through a known thickness of glass. The thorough study is substantiated by extensive tables and transmission graphs. Determinations of the transmission in the visual spectral region were made at temperatures of 20°, 100°, 200°, 300°, 400°, 500°, and at or near the approximate softening temperature (M_θ) for 27 glasses; for a copper ruby glass, however, the upper limit was restricted to 450° because of permanent color and transmission change occurring on heating at higher temperatures. For one heat-resisting glass, the measurements were carried to 800°. The determinations were made for rising and falling temperatures, and the original 20° measurements were finally rechecked to insure absence of permanent change on heating. Of the 27 glasses used in the form of optically polished disks 19 mm. in diameter, a soda-lime-silica and a soda-boric oxide-silica glass were melted in platinum from pure materials and served as a basis of reference, the 25 others being commercial glasses covering a wide range, including chemical and heat-resisting glasses, plate and decolorized bottle glasses, lead-containing glasses for domestic purposes, colored glasses for bottles and for heat-protecting purposes, and color filters. The complete compositions of these glasses are given, including all the minor constituents likely to exercise selective absorption. Two standards of thickness, 2 mm. and 10 mm., were employed, according to whether the glass was colorless (or nearly so) or colored. The range of wave length was from 4400 to 7200 a.u., measurements being carried out at each intermediate 100-a.u. interval. Thorough tests showed that the whole of the light incident on the glass specimen could be accounted for in the experiments, and it was particularly demonstrated that no change in the loss by reflection with rise or fall of temperature took place other than that dependent on the variation with temperature of the refractive index of the glass. Generally, reduction in the transmission and a shift of the maximum transmission toward the long wave length end of the spectrum occurred progressively with rise of temperature. This was uniformly the case with colorless and only faintly colored glass, although the effect of temperature rise affected the transmission of such glasses differently at different wave lengths, particularly for the extreme ends of the visual spectrum. The least effect was observed for the colorless standard glasses free from any but traces of selective absorbing agents (Fe_2O_3 and Pt), the soda-lime-silica glass having its over-all transmission for illuminant C reduced from 91 to 86% between 20° and 600° and the corresponding values for a soda-boric oxide-silica glass being 90 and 88%, respectively. In the case of glasses colored by Fe_2O_3, FeO, CoO, NiO, Cr_2O_3, Mn_2O_3, "Di_2O_3," S, Se, Cu, and Au, the following observations are noteworthy: (1) the dominant effects of certain oxides, particularly Cr_2O_3 and CoO even in extremely small amounts, whether in colored or faintly colored glasses; (2) the sharper cut-off in the violet end produced by relatively small amounts of sulfur (with carbon and low iron oxide) than by considerable amounts (1 to 2%) each of Fe_2O_3 and MnO; (3) the presence of points of intersection in the temperature-transmission curves for glasses containing Cr_2O_3, Fe_2O_3 and MnO, and CoO, whereby in certain wavelength regions transmission fell with rise of temperature and in others showed inverse behavior; (4) the presence of points of intersection in a number of glasses in the graphs obtained by plotting temperature against wave length for a specific transmission, these points corresponding to the transformation temperature (T_g) and others to additional transition points of the glass. A potash-lead oxide (31%)-silica glass alone of the colorless glasses showed this phenomenon. For the colored and three colorless glasses the effect of temperature on the color was calculated by the method of A. C. Hardy for the C.I.E. coefficients, x, y, and z, and the results are given in tables and graphs.

R.H.B.

PATENTS

Apparatus for blowing and cooling glassware. W. K. BERTHOLD (Hartford-Empire Co.). U. S. 2,282,848, May 12, 1942 (March 17, 1939).

Apparatus for handling glassware. C. F. POSTEN (Hazel-Atlas Glass Co.). U. S. 2,284,766, June 2, 1942 (March 10, 1941).

Apparatus and method of forming and treating glassware. W. K. BERTHOLD (Hartford-Empire Co.). U. S. 2,284,796, June 2, 1942 (Dec. 20, 1939).

Apparatus and method for regulably controlling the temperature of molten glass in forehearths. W. T. BARKER, JR. (Hartford-Empire Co.). U. S. 2,282,554, May 12, 1942 (Nov. 1, 1939).

Apparatus for polishing glass. F. B. WALDRON (Pilkington Bros., Ltd.). U. S. 2,285,318, June 2, 1942 (Dec. 10, 1940).

Apparatus for producing multiply glass sheet glazing units. C. D. HAVEN (Libbey-Owens-Ford Glass Co.). U. S. 2,283,253, May 19, 1942 (Sept. 7, 1939).

Apparatus for use in cutting laminated safety glass. L. F. GUNTHER (Libbey-Owens-Ford Glass Co.). U. S. 2,283,251, May 19, 1942 (Aug. 15, 1939).

Colorimeter. A. H. BENNETT AND R. S. ESTEY (Spencer Lens Co.). U. S. 2,281,545, May 5, 1942 (Feb. 23, 1939).

Composite glass and metal envelope. D. W. POWER (Radio Corp. of America). U. S. 2,283,090, May 12, 1942 (April 30, 1941).

Cooler for glass furnaces. F. S. THARP (Pittsburgh Plate Glass Co.). U. S. 2,284,348, May 26, 1942 (June 16, 1939).

Electric furnace. A. E. A. S. CORNELIUS (Hartford-Empire Co.). U. S. 2,283,188, May 19, 1942 (Jan. 6, 1941).—An electric resistance furnace, in which molten glass or other substance being made acts as a resistance to electric current, comprising a melting and refining chamber.

Electric glassmelting furnace. BRITISH THOMSON-HOUSTON CO., LTD. (J. Ferguson). Brit. 544,177, April 15, 1942 (Jan. 31, 1941).

Electrical glass-splitting machine. J. F. TURKE. U. S. 2,282,440, May 12, 1942 (Oct. 6, 1938).

Electrode arrangement for glass furnaces, etc. JOHN FERGUSON. U. S. 2,283,800, May 19, 1942 (May 14, 1941).

Feeding glassmaking batches. H. L. HALBACH, W. G. KOUPAL, AND WILLIAM OWEN (Pittsburgh Plate Glass Co.). U. S. 2,284,420, May 26, 1942 (April 11, 1940).

Fitting for tempered glass panels. G. F. ERATH (Pittsburgh Corning Corp.). U. S. 2,284,409, May 26, 1942 (March 8, 1940).

Forming hollow articles. C. G. STAELIN (Owens-Illinois Glass Co.). U. S. 2,285,370, June 2, 1942 (Jan. 13, 1938).

Frost-resistant glass. FRED CORNETTO (M. M. Sullivan). Can. 403,408, March 10, 1942 (Aug. 22, 1940; in U. S. Aug. 26, 1939). G.M.H.

Furnace construction and method of repair. H. H. BLAU AND K. K. KNAELL (Carborundum Co.). U. S. 2,284,797, June 2, 1942 (June 8, 1936).

Glass-filament fabrication. PIERO MODIGLIANI (Fiberglas Canada, Ltd.). Can. 404,378, April 28, 1942 (Sept. 18, 1939). G.M.H.

Glass flare feeding apparatus. JOHN FLAWS, JR. (Canadian General Electric Co., Ltd.). Can. 403,600, March 24, 1942 (April 26, 1940). G.M.H.

Glassforming machine. S. D. BERT (M. A. Yorkin and J. D. Martin). U. S. 2,282,449, May 12, 1942 (Feb. 8, 1940).

Glass sheet tempering apparatus. EDOARDO FERLITO. Can. 404,160, April 14, 1942 (Oct. 24, 1939). G.M.H.

Glass solutions. WESTINGHOUSE ELECTRIC INTERNATIONAL CO. Brit. 544,734, May 6, 1942 (March 16, 1940).

Glass tube reshaping apparatus. C. E. HAHN AND JOHN SALO (General Electric Co.). U. S. 2,284,089, May 26, 1942 (Oct. 20, 1939).

Glassware lehr. D. G. MERRILL (Hartford-Empire Co.). U. S. 2,284,832, June 2, 1942 (Feb. 12, 1941).

Glassworking apparatus. D. E. GRAY, L. N. POND, AND W. C. WEBER (Corning Glass Works). U. S. 2,283,055, May 12, 1942 (Aug. 12, 1938; Dec. 11, 1939).

Glassworking machine. W. B. WINES (Western Electric Co.). U. S. 2,285,181, June 2, 1942 (Aug. 23, 1940).

Grinding apparatus. G. R. ROESCH AND GERALD WHITE (Libbey-Owens-Ford Glass Co.). U. S. 2,283,289, May 19, 1942 (Aug. 12, 1941).—An apparatus for grinding the edges of plates of glass.

Insulating glass felt. PIERO MODIGLIANI (Fiberglas Canada, Ltd.). Can. 404,097, April 14, 1942 (March 7, 1939). G.M.H.

Knife-operating mechanism for glass-blowing machines. J. P. BENOIT (Owens-Illinois Glass Co.). U. S. 2,285,325, June 2, 1942 (Nov. 27, 1940).

Luminescent glass. MAGDALENE HÜNIGER AND HANS PANKE (General Electric Co.). U. S. 2,284,055, May 26, 1942 (May 17, 1940).

Manufacture of laminated glass. PATRICK FINNEGAN (American Window Glass Co.). U. S. 2,282,399, May 12, 1942 (June 27, 1940).

Method and apparatus for supplying granular material. K. G. KUTCHKA (Pittsburgh Plate Glass Co.). U. S. 2,284,398, May 26, 1942 (April 11, 1940).—A method of supplying granular material upon a molten bath.

Multifocal lens. STUART J. HEAVYSIDE (Univis Corp.). Can. 403,266, March 3, 1942 (Oct. 14, 1939). JACK R. SILVERMAN (Univis Corp.). Can. 403,265, March 3, 1942 (Sept. 21, 1939; in U. S. June 13, 1939). G.M.H.

Tempered glass sheet production. EDOARDO FERLITO. Can. 404,159, April 14, 1942 (Sept. 22, 1938). G.M.H.

Treatment of siliceous material and the manufacture of glass. N. S. GARBISCH. Brit. 544,741, May 6, 1942 (Nov. 29, 1939).

Yellow-glass composition. H. H. BLAU AND W. H. GILLETT (Corning Glass Works). U. S. 2,282,601, May 12, 1942 (June 25, 1938).—A yellow-tinted glass containing silica, alkali oxide, zinc oxide, and about 0.005 to about 0.1% nickel oxide.

Structural Clay Products

Bomb shelters. ANON. *Brick & Clay Record*, **100** [2] 31–33 (1942).—Results of detonation tests on brick, steel, and other types of materials used for bomb shelters are given. B.C.R.

Efflorescence bibliography. ANON. *Brick & Clay Record*, **100** [2] 42 (1942).—19 references. B.C.R.

Minimum heat insulation in the construction of stables. J. S. CAMMERER AND H. RACH. *Wärme- & Kälte-Tech.*, **42** [5] 69–71 (1940); abstracted in *Physik. Ber.*, **21** [24] 2411 (1940).—The minimum thicknesses of brick walls for dwellings and stables are given for outside temperatures of −15°, −18°, −21°, and −24°C. with which the formation of condensed water remains within permissible limits and the building remains dry. From practical observation, a relation is developed between too-small wall thickness and resulting humidity of the wall. M.H.

Production of paving brick. ADOLF MÖSER *Sprechsaal*, **73** [50] 463–64 (1940).—Dark-blue to steel-black brick bring the highest price, but they are not easy to produce. The raw material must be refractory, for the desired brick require complete vitrification or a near approach to the softening point, and the material must contain the required large amount of iron oxide. Some clays are refractory enough but contain too little iron; with clays containing 5 to 7% iron oxide, good paving brick can be easily obtained. If the firing temperature is over 1200°C. (Seger cone 6*a*), the iron is in an unstable form and, under reducing conditions, readily becomes FeO; this, in combination with the Fe_3O_4 and the low melting point of the ferric silicate, gives the dark color and the silky luster. If the material is so refractory that a higher firing temperature can be used, the dark color is obtained almost automatically. The problem then is not to lose the color again by admitting too much air at the lower temperatures where the change in iron oxides is reversible. This is called "afteroxidation." If the vitrification point is around 1100° to 1050°C., the artificial conditions for the formation of the dark-colored iron compounds must be obtained by a reducing atmosphere. Afteroxidation sets in, however, as soon as these conditions are changed. With low-firing bodies, therefore, the reducing action is assured by using strongly smoking fuel at the end of the firing, for a smoky coal fire does not always cause reduction in the kiln. In most cases, the chief method of obtaining the dark color consists in completely closing the kiln so that it can cool off in a smoky reducing atmosphere. This restricts the utilization of heat and decreases the speed of operations, especially with continuous kilns. Assuming that all openings are closed, at the end of firing there will be in the kiln CO, CO_2, N, and unburned fuel, i.e., mainly highly heated gases, expanded about three-fold. When a new kiln is closed and cooled, a vacuum will be formed. Any kiln which has been in use has so many leaks that the value of the method is doubtful. The chief result of the slow cooling is the production of tough brick. It is generally sufficient to close the kiln doors and the damper, and the damper must close tightly. Salting produces a glaze that protects the color of the brick, but poor colors may be obtained if the salting is improperly done. The above rules cannot be followed when salt is used. In a case where the raw material contained 5% iron and the firing temperature was Seger cone 6*a*, oil and pitch were used to produce smoke, the fire was salted, and the kiln was closed. The brick were bright yellowish brown and gray, the result of closing the kiln before the salt vapor had left it, and the HCl present had a bleaching action. The desired dark-colored brick were obtained on the next firing when the kiln was not completely closed. W.H.H.

SEPARATE PUBLICATIONS

Low-Cost Glazes for Structural Clay Products. RAY T. STULL AND PAUL V. JOHNSON. *Nat. Bur. Standards*

Circ., C436, 20 pp. Supt. of Documents, Govt. Printing Office, Washington, D. C. Price 10¢.—Three groups of clays, consisting of 3 shales, 3 surface clays, and 2 fire clays, were investigated to determine their glaze-making properties when used as integral parts of glaze compositions. Six fluxes and 8 different materials for producing glaze colors were included in the investigation. R.A.H.

Suitability of North Carolina Shales and Clays for Mortar Mixes. A. F. GREAVES-WALKER AND W. A. LAMBERTSON. *N. C. State Coll. Eng. Expt. Sta. Bull.*, No. 23, 23 pp. (1942).—The requirements of satisfactory mortars are discussed, and previous work on the substitution of clay for lime in mortars is reviewed. Three North Carolina clays were used in this investigation: (1) a Triassic shale, (2) a Pre-Cambrian shale, and (3) an alluvial clay. All were pulverized to pass a 95-mesh sieve before incorporation in the cement-sand-clay mortars under study. From results of tests for consistency, tensile and compressive strengths, absorption and porosity, shearing bond strength of mortar units, and resistance to freezing and thawing, the following conclusions were drawn: (1) The use of North Carolina Triassic shale, Pre-Cambrian shale, and alluvial clays as substitutes for lime in mortars is practical from both economic and utility standpoints. (2) The order of adaptability of the clays investigated is (*a*) Pre-Cambrian shale, (*b*) alluvial clay, and (*c*) Triassic shale. (3) Mortars meeting all requirements can be produced by the substitution for lime of (*a*) 20 to 40% Pre-Cambrian shales, (*b*) 20 to 40% alluvial clays, or (*c*) 30 to 40% Triassic shales. (4) Mortars containing clays require less mixing water than those containing lime. (5) Satisfactory cement-clay-sand mortars can be produced at less cost than cement-lime-sand mortars. (6) The substitution of clays for lime does not affect the color of the mortar to a noticeable extent. (7) The clay-containing mortars have practically zero shrinkage and therefore produce tight joints. P.S.D.

PATENTS

Tile and method of sealing. J. M. MURDOCK. U. S. 2,285,046, June 2, 1942 (Dec. 9, 1939).

Vitreous clay underground conduit. A. P. MCDONALD. U. S. 2,282,073, May 5, 1942 (Jan. 19, 1939).

Refractories

Bauxite and kaolin refractory materials containing alumina. VINCENZO SOLLAZZO. *Ricerca Sci.*, **11** [6] 469–71 (1940); abstracted in *Chem. Zentr.*, **1941, I,** 1585.—Refractory block were made of bauxite with kaolin earth as bond. The initial material was pulverized to the 4900-mesh per sq. cm. size, pressed under a pressure of 700 kgm. per sq. cm., and fired 6 to 7 hr. at 1460° to 1480°. A refractoriness of up to 1850° (1800° under a pressure of 2 kgm. per sq. cm.) was obtained. When Fe_2O_3 or TiO_2 was present, the refractoriness diminished. The optimum refractoriness was reached with a ratio of SiO_2:Al_2O_3 = 1. M.V.C.

Choice of a lining for rotary kilns for the calcining of cement clinker. S. V. GLEBOV. *Trudy Vsesoyuz. Inst. Ogneuporov*, **1939,** No. 18, pp. 66–106; *Chem. Zentr.*, **1940, I,** 2367; *Chem. Abs.*, **35,** 7671 (1941).—For lining the sintering zones, G. makes the following recommendations: for readily calcined clinker, use grog containing not less than 38% Al_2O_3 and having a porosity of not over 20% or talc containing at least 38% MgO; for average clinker, use chrome magnesite containing not over 50% MgO or brick containing 65 to 72% Al_2O_3; for clinker difficult to sinter, use unfired chrome magnesite, chromite concrete, or chrome magnesite brick containing not over 50% MgO.

Good brickwork can insure better service of refractories. ALEX M. MORTON. *Brick & Clay Record*, **100** [1] 59, 60 (1942).—M. discusses types of refractories and the methods of installation used in steel plants. Lack of adequately trained and experienced brickmasons is reflected in the quality of present-day brickwork and the length of service obtained. B.C.R.

Lining materials for blast-furnace bottoms and hearths. A. I. STUPNIKOV AND P. K. KALININ. *Uralskaya Metallurgiya*, **8** [2] 8–11 (1939); *Chem. Zentr.*, **1940, I,** 2046; *Chem. Abs.*, **35,** 7670 (1941).—Tamped masses were superior to brick linings. Equally good results were obtained with quartz or grog materials. Quartzite used alone must contain over 98% SiO_2 and less than 1.5% Fe_2O_3; it must be washed under pressure, fired 2 to 2.5 hr., sorted (pieces rich in Fe rejected), crushed, and screened, and the pieces greater than 8 x 8 mm. must be ground. The clay must be plastic and must contain less than 2% Fe_2O_3. It is dried at 300° to 400°, screened, and ground. The clay-quartzite mix contains 10% clay (0.5 mm.), 40% quartzite (91% or more SiO_2, 2.5% or less Fe_2O_3) of 0.5- to 2-mm. grain size, 25% each of quartzite of 2- to 5- and 5- to 8-mm. size, and 6 to 8% water. After aging, it is applied in a layer 4 to 6 in. thick and tamped smooth. After tamping, an iron rod 10 to 12 mm. in diameter and 0.8 to 0.9 m. long, loaded only with its own weight, should not penetrate the material more than 5 mm.

Method for refining alunites. V. A. VANYUKOV AND D. I. LISOVSKIĬ. *Yubileĭnyĭ Sbornik Trudov Kafedry i Lab. Tyazhelykh Metallov Moskov. Inst. Tsvetnykh Metallov i Zolota*, **1939,** No. 7, pp. 233–36; *Khim. Referat. Zhur.*, **1940,** No. 1, p. 101; *Chem. Abs.*, **36,** 1445 (1942).—The Zaglikian alunites contain Al_2O_3, K_2O, Na_2O, and SO_3 (valuable components) and SiO_2 and Fe_2O_3 (worthless minerals). The authors tested a method of refining that requires no addition of chemical reagents because the necessary H_2SO_4 is produced from the minerals by the use of SO_3; pure alumina is obtained which contains only traces of SiO_2 and Fe_2O_3. The proposed method is based on the different solubilities of the components of the raw materials after different heat-treatments. K alums, Al_2O_3, K_2SO_4, Na_2SO_4, and (SiO_2 + Fe_2O_3) are obtained.

Mineral formation at the place of contact of silica brick and magnesite in the open-hearth furnace. D. S. BELYANKIN AND B. V. IVANOV. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, **1941,** No. 3, pp. 91–99; *Chem. Abs.*, **35,** 7338 (1941).—In the open-hearth furnace at the place of contact of silica brick and magnesite, a light-gray mass of approximately 60% clinoenstatite, 20% augite with enstatite diopside, and cristobalite magnetite was formed. The clinoenstatite is well formed along the prism 110 and both pinacoids 010 and 100. The position of the surface of optical axes is normal with respect to 010, angle of extinction Cn_g 21.5°, optically positive, 2 V 44°; the values of n determined by the immersion method in polished samples along 010 are n_g 1.662, n_m 1.653, and n_p 1.651. The change from clinoenstatite to enstatite diopside is always abrupt, and from enstatite to augite it is gradual. The constants of enstatite diopside are as follows: Cn_g changes from 35° at the place of contact with clinoenstatite to 44° at the point of transition to the yellow-green augite, optically positive, 2 V practically zero, n_g 1.686, n_p 1.658. The constants of the yellow-green augite are as follows: Cn_g 49° to 52°, surface of optical axes 010, optically positive, 2 V 68° to 82°, n_g and n_p at the intensively colored regions 1.742 and 1.702, respectively. The chemical composition of the mineral is SiO_2 58.45, TiO_2 0.90, Al_2O_3 1.34, Fe_2O_3 5.18, FeO 2.75, MnO 0.63, CaO 3.29, MgO 27.06, K_2O 0.10, Na_2O 0.19, and P_2O_5 0.11%. The reaction between silica brick and magnesite begins at 1500°. At 1600° it begins to exhibit its destructive force. 8 references.

Modern blast-furnace refractories. R. E. BIRCH. *Blast Furnace & Steel Plant*, **30** [3–4] 345–50, 437–40 (1942).—B. reviews the literature on service factors, such as uniformity of size, resistance to abrasion, resistance to disintegration by CO and to slag attack, constancy of

volume at high temperatures, permeability, and the problem of alkali. A bibliography is included. B.L.

Preparation of refractory and of coal-ash test cones. RUSSELL J. SMITH. *Jour. Amer. Ceram. Soc.*, **25** [10] 282 (June, 1942).

Product of reaction between silica brick and a slag of high lime and iron oxide content. W. HUGILL. *Bull. Brit. Refrac. Research Assn.*, No. 49 (March, 1939); reprinted in *Trans. Brit. Ceram. Soc.*, **41** [2] 46–50 (1942).—A crystalline product of apparently unique properties was observed during the microscopical examination of silica brick which had been subjected to the action of lime-alumina-silica-iron oxide slags. The crystals were orthorhombic with $\alpha = 1.92$, $\beta =$ about 1.95, and $\gamma = 2.0$. The known minerals most closely resembling the product are of the pyroxene group, and a comparison is made. R.A.H.

Rammed linings for small electric furnaces. HENRY C. FISHER. *Metal Progress*, **41** [2] 187–91 (1942).—F. describes in detail the equipment and procedure for installing a rammed lining in small electric furnaces, such as Detroit Electric Furnace Co. LF rotating furnaces and Ajax-Northrup high-frequency induction furnaces. B.C.R.

Recent advances in refractory technology. H. K. MITRA. *Proc. Inst. Chemists* [India], **12** [III–IV] pp. 95–119 (1940).—M. presents a brief discussion and literature review of the following comparatively recent developments in the refractories industry and its related technology: (1) development of new types of equipment including (*a*) the counter-current mixer, (*b*) the humidity drier, and (*c*) deairing equipment; (2) development of new techniques and processes for old materials including (*a*) advances in calcination processes for certain hitherto little-used magnesite ores, (*b*) production and use of sea-water magnesite for basic brick, (*c*) developments in the electric fusion of magnesites, (*d*) production of chemically bonded, unfired magnesite brick, and (*e*) the development of porous magnesite brick; (3) development of new refractories from familiar materials or from materials not hitherto used including (*a*) chrome-magnesite developments, (*b*) water-resistant dolomite brick developments, (*c*) progress in forsterite refractories, and (*d*) progress and developments in insulating refractories. New techniques in the testing and control of refractories are surveyed briefly. P.S.D.

Refractories for water-gas machines. C. E. BALES AND A. R. BLACKBURN. *Gas Age*, **88** [4] 26–28, 33 (1941); *Chem. Abs.*, **35,** 7671 (1941).—Refractories used for lining blocks, dome brick, pipe liners, and checker brick are discussed.

Resistance to corrosion shown by refractory linings of the rotary kiln in the direct process. BUNPEI YOSIKI. *Jour. Japan. Ceram. Assn.*, **48** [565] 3–11 (1940); *Chem. Zentr.*, **1940, I,** 2366; *Chem. Abs.*, **35,** 7670 (1941).—The Krupp direct process (for the metallurgical treatment of Fe in the rotary kiln) has been introduced into Japan. The resistance of different linings to corrosion was determined both by the immersion method and by petrographic investigation. Although Radex E brick consists of chromite magnesite and should resist both basic and acid slags, it showed less resistance to corrosion than other materials tested and permitted penetration of the slag. German quartz schist showed good resistance to the action of a very acid slag; it was converted by firing into a porcelain-like dense mass which was not penetrated by the slag. Similar tests with Japanese quartz schist did not give satisfactory results. Black Corhart brick, which forms a neutral refractory and consists chiefly of mullite, showed the best resistance to corrosion toward both basic and acid slags owing to the formation of a dense crystalline protective layer. See "Corrosion . . . ," *Ceram. Abs.*, **18** [3] 70 (1939).

Separation of aluminum oxide from alums and mother liquors obtained from the Zaglikian alunites. V. A. VANYUKOV, D. I. LISOVSKIĬ, V. YA. KOROLYUK, D. I. FILIN, AND N. F. KVASKOV. *Yubileĭnyĭ Sbornik Trudov Kafedry i Lab. Tyazhelykh Metallov Moskov. Inst. Tsvetnykh Metallov i Zolota*, **1939,** No. 7, pp. 279–300; *Khim. Referat. Zhur.*, **1940,** No. 1, p. 102; *Chem. Abs.*, **36,** 1443 (1942).—Thermal and H_2SO_4 treatments of alunite give an $Al_2(SO_4)_3$ solution with impurities of Na_2SO_4 and crystalline K alum. The object of the experiments was to treat the first solution to obtain Al_2O_3 and Na_2SO_4 and the alum to obtain Al_2O_3 and K_2SO_4. The pulverized alums were dehydrated in suspension at a temperature slightly above 400°. The dehydrated alums were decomposed in suspension at 1150° to 1200°. The SO_3 content in the decomposed material was 26 to 28%. The decomposed alums were leached with boiling water. Filtration after leaching is rapid if the decomposed material is leached in the same form in which it was removed from the oven (in the form of fine, swollen bubbles). After an 8-fold washing with hot water, the residue contained approximately 0.20% K_2O. On cooling, K_2SO_4 crystals were separated from the saturated solution after filtration. The Al_2O_3 residue was dried. The $Al_2(SO_4)_3$ solution, with Na_2SO_4 impurity, can be dehydrated without transforming it into alum and decomposed into Al_2O_3, SO_2, and Na_2SO_4. Treatment of the semifinished products produces two kinds of Al_2O_3: (1) the pure Al_2O_3 after the decomposition of K alum, and (2) Al_2O_3 with Fe impurities after the decomposition of the $Al_2(SO_4)_3$ solution. First-grade Al_2O_3 can be obtained from the solutions if they are transformed into alums and decomposed. A 100% extraction of K_2SO_4 from alunite is obtained. The proposed method permits a complete utilization of the raw material, producing Al_2O_3, K_2SO_4, H_2SO_4, Na_2SO_4, and (SiO_2 + Fe_2O_3).

Service of fire clay with graphite additions. FRITZ HARDERS. *Stahl & Eisen*, **60,** 475–78, 502–508 (1940); *Chem. Abs.*, **35,** 7670 (1941).—Melting point, pressure heat resistance, slagging resistance, and thermal-shock resistance of stoppers made with graphite additions are considerably higher than those of plain fire-clay and clay stoppers. While FeO may attack fire clay more severely than MnO, the opposite is true with graphite-containing material. Best results are obtained with a total C content of 10%.

Shetland chromite as a refractory material. T. R. LYNAM AND T. W. HOWIE. *Trans. Brit. Ceram. Soc.*, **41** [2] 27–45 (1942).—A study was made of Shetland chromite from the Island of Unst. It has a high silica content, but the gangue material is very refractory and the ore, on reaction with magnesia, yields a chrome-magnesite brick of high refractoriness under load and low bursting expansion in contact with iron oxide. Lime, alumina, and titania have a deleterious influence on the properties of the gangue, but certain additions of iron oxide or iron oxide with lime raise the refractoriness under load of 80-20 gangue-magnesia mixtures. The influence of these fluxes on the mineralogical constitution of the product was studied by means of X rays. Plant trials in open-hearth and arc furnaces have given encouraging results, and the use of chrome-magnesite brick made from Shetland chromite is now considered standard practice. R.A.H.

Structure of magnesia refractory materials. B. TAVASCI. *Chimica & Industria*, **23,** 255–62 (1941); *Chem. Abs.*, **35,** 8229 (1941).—Five commercial samples contained SiO_2 2.60 to 4.40, Al_2O_3 + TiO_2 0.95 to 6.67, Fe_2O_3 2.31 to 6.08, CaO 2.50 to 9.45, and MgO 80.63 to 93.58%. Roentgenographic, metallographic, and chemical methods showed periclase, monticellite, dicalcium silicate, forsterite, solid solutions of the brownmillerite type, and several species of spinels.

Titanium in blast-furnace lining. S. JANSSON. *Jernkontorets Ann.*, **124,** 274–76 (1940); *Chem. Abs.*, **35,** 7670 (1941).—An analysis of Cu-colored crystals found in the interstices of the lining brick in the hearth of a blast furnace is given. The material (approximately 6TiN + TiC) contained only 3.8% Fe. The sintered ore charged had contained 0.14% Ti and the pig iron 0.035% Ti.

SEPARATE PUBLICATION

Development of an Unfired Pyrophyllite Refractory. A. F. GREAVES-WALKER AND J. J. AMERO. *N. C. State Coll. Eng. Expt. Sta. Bull.*, No. 22, 108 pp. (1941).—A brief dis-

cussion is given of (1) the classification of refractories, (2) properties of refractories, (3) methods of forming refractories, (4) unfired refractories, and (5) the potential market for unfired refractories in North Carolina. A brief review of the occurrence, distribution, geology, and mineralogy of the North Carolina deposits of pyrophyllite is followed by a review of previous work of ceramic interest on the mineral. Preliminary studies of a large number of grain-size distributions formed under pressures varying from 500 to 8000 lb. per sq. in. led to the qualifying conclusion that careful control is necessary during the crushing and screening operations to insure a maximum recovery of material passing 10-mesh and retained on 20-mesh. The best body composition was determined to be pyrophyllite through 10- and on 20-mesh, 56.3; pyrophyllite through 28- and on 48-mesh, 7.8; pyrophyllite through 80-mesh, 15.9; and S.G.P. ball clay through 200-mesh, 20.0%. Furthermore, a forming pressure of 5000 lb. per sq. in. was found to give best results. The above body composition was used throughout the remainder of the investigation in conjunction with various bonding agents. All test compositions were formed under the recommended pressure of 5000 lb. per sq. in. and tested for (1) P.C.E., (2) hot load strength, (3) thermal expansion, (4) resistance to attack of various slags, (5) temperature gradient, and (6) thermal conductivity. Results were compared with those for a high-grade fired refractory made from a Missouri fire clay. The following conclusions were drawn: (1) A satisfactory high heat duty, unfired, dry-pressed refractory may be produced employing pyrophyllite as the major ingredient. (2) Six of the bonding agents tested produce satisfactory unfired pyrophyllite refractories. In order of best all-round efficiency they are (*a*) sodium aluminate 2.0, (*b*) sodium aluminate 2.0 plus Bakelite 1.5, (*c*) Bakelite 1.5, (*d*) superior binder 1.5, (*e*) sodium aluminate 1.5 plus sodium silicate 1.1, and (*f*) sodium silicate 1.5%. (3) Approximately 25% of the total body composition should be of the coarse grains (through 10-mesh and retained on 20-mesh) precalcined at 2400°F. (4) Pyrophyllite refractories should not be used in contact with slags that have high iron content or that are strongly basic. (5) The strength and toughness of the recommended compositions should be sufficient to withstand handling and shipping under normal conditions. (6) No trouble should be encountered with unfired dry-pressed pyrophyllite refractories of the recommended compositions with regard to spalling, hot load failure, failure due to temperature gradient, or thermal expansion. P.S.D.

PATENTS

Basic refractory. MARK DOUGLAS, A. L. BRADLEY, AND J. H. CHESTERS. Can. 404,767, May 19, 1942 (May 27, 1940). G.M.H.

Cast refractory block. G. S. FULCHER (Corhart Refractories Co.). U. S. 2,285,026, June 2, 1942 (Sept. 23, 1939).

Checker brickwork furnace regenerator structures. BONNYBRIDGE SILICA & FIRECLAY CO., LTD., AND W. MCBRYDE. Brit. 544,461, April 29, 1942 (Jan. 20, 1941).

Furnace wall. KARL SCHROEDER (American Arch Co.). U. S. 2,281,951, May 5, 1942 (Sept. 20, 1938).

Insulating and refractory plastic. D. A. HOWELL, P. S. GILCHRIST, W. W. INGLE, AND L. H. CROSSON (Charlotte Chemical Laboratories, Inc.). U. S. 2,282,361, May 12, 1942 (July 1, 1939).—A refractory heat-insulating composition in the nature of a heavy thick cohesive mass and containing a preponderant proportion of a granular hydrous rock-forming aluminum silicate, a substantially smaller portion of an acid orthosilicate which is characterized by colloidal-size particles, a liquid adhesive binder, and just sufficient water to moisten the composition and render it workable and applicable as a thick cohesive mass, the varying particle size of the granular aluminum silicate being such that approximately 12 to 42% may be retained on a No. 20 U. S. Standard Screen and approximately 4 to 11% may be retained on a No. 10 U. S. Standard Screen, the amount of water and varying particle size of the aluminum silicate being so controlled in the composition that substantially no dimensional changes will take place therein upon application of heat.

Making dolomite briquettes for use in the production of magnesium. J. S. PEAKE (Dow Chemical Co.). U. S. 2,282,241, May 5, 1942 (May 26, 1939).

Manufacture of basic refractories. MARK DOUGLAS, A. L. BRADLEY, AND J. H. CHESTERS. U. S. 2,285,020, June 2, 1942 (June 3, 1940).—The process of manufacturing a molded dolomite-magnesite refractory which consists in grinding a stabilized dolomite clinker, separating from the ground clinker a fraction of coarse grain size which passes through a $^3/_{16}$-in. mesh sieve but is retained on a 12 B.S.S. sieve and a fraction of fine grain size which passes through a 100 B.S.S. sieve, mixing together proportions of the coarse and fine fractions with a proportion of dead-burned magnesite of grain size intermediate between that of the coarse and fine fractions of dolomite, and molding and firing the mixture.

Manufacture of refractory materials. CORNING GLASS WORKS. Brit. 544,197, April 15, 1942 (Oct. 20, 1939).

Manufacture of refractory materials. V. M. GOLDSCHMIDT AND K. J. STENVIK. U. S. 2,283,250, May 19, 1942 (May 13, 1937).—A process for the manufacture of refractory products essentially comprising magnesium orthosilicate which comprises admixing with a batch containing such magnesium orthosilicate 1 to 10% of at least one metal as a bonding material in a finely subdivided state and capable of forming an oxygen compound coalescing with the refractory upon firing of the refractory and then preparing shapes from the mixture.

Producing alumina. H. L. COLES (William Sokolec and H. W. Dix). U. S. 2,283,849, May 19, 1942 (July 25, 1939).—In the method of producing alumina from bauxite, the steps which comprise mixing bauxite and an amount of lime between that which is sufficient to transform all of the silica and part of the alumina present in the bauxite to $2CaO \cdot SiO_2 \cdot Al_2O_3$ and the remainder of the alumina to $3CaO \cdot 5Al_2O_3$ and that amount of lime which is sufficient to transform all of the silica and part of the alumina to $2CaO \cdot SiO_2 \cdot Al_2O_3$ and the remainder of the alumina to $CaO \cdot Al_2O_3$, the amounts of lime being 24.7 to 41%, of silica 3.5 to 21.8%, and of alumina 75.3 to 37.2%, passing this mixture through a drying kiln, heating the mixture in the kiln to a temperature between 650° and 815°C. to dry it, then crushing this mixture to 80- to 100-mesh, then passing this so-crushed mixture through a calcining kiln and heating the mixture in the kiln to a temperature of about 1500° to not more than 1700°C. to form an insoluble calcium aluminum silicate and soluble calcium aluminates, passing the silicate and calcium aluminates to a digester having a bath of sodium hydroxide and sodium carbonate, the sodium hydroxide including recycled sodium hydroxide, filtering the product from the digester to remove the insoluble silicate with red mud, crystallizing and separating out the alumina, returning some of the sodium hydroxide to the digester, and adding sodium carbonate to the digester to replace the sodium hydroxide which was removed.

Refractories and methods of making. TITANIUM ALLOY MFG. CO. Brit. 544,628, May 6, 1942 (April 18, 1940).

Tile for furnace construction. M. H. DETRICK CO. AND A. H. STEVENS. Brit. 544,876, May 13, 1942 (March 30, 1940); divided out of Brit. 540,094.

Terra Cotta

Improving thermal-shock resistance of chemical stoneware bodies. JAN OTTO KNIZEK. *Ceram. Ind.*, **37** [6] 74–76 (1941).—The spalling resistance of stoneware bodies can be improved by increasing the thermal conductivity with ferrosilicon, silicon carbide, or corundum and by lowering the thermal-expansion coefficient by the addition

of talc or other magnesium-bearing materials to the body. Such material contains cordierite as the chief crystal phase in the fired state. H.T.

Tile stoves. RUD. TELCHERT. *Sprechsaal*, **73** [49] 452–53 (1940).—After centuries of use, tile stoves are now in competition with hot-water heating. In apartment houses, the heat must be paid for whether or not it is desired or used. Iron stoves and kitchen ranges were satisfactory, but in wartime the need for iron has turned attention back to tile stoves. A comparison of the cost of fuel for hot-water or steam heating and for tile stoves shows the economy of the latter. The advantages of central heating may be outweighed by the cost of repairs, and the intense heat and dust from radiators is unpleasant to the respiratory organs. Up to the end of the 19th century, 90% of the living rooms were heated by tile stoves. By the efforts of the central heating industry, some of the stoves were displaced, but improved stoves are now being used. The new scientifically designed stoves have the following advantages: economy in first cost, repairs, and fuel, effective distribution of heat, fulfillment of hygienic requirements, and long life. If tile stoves such as those now built to heat several rooms had been available earlier, hot-water and steam heating plants would never have been installed to such an extent. The modern tile stove for several rooms uses moderately warmed fresh air to convey the heat. The heating operation is the same as with central hot-water heating. The air comes in contact with a heated surface and gives off heat to the walls of the space to be heated. The cooled air returns to the bottom of the stove and the circuit is complete. Circulation and efficiency are increased by forcing the air to pass through passages of definite size to reach the heated surfaces. Several adjacent rooms can be heated by one stove, thus requiring much less work. The temperature can be easily regulated, and injurious fluctuations of temperature can be avoided. The fire pot and conduits for cold and hot air are arranged so as to be accessible for cleaning; there is no danger of freezing as in the case of hot-water heating. W.H.H.

PATENTS

Flanged wall coping. J. P. DUFFY (Stillwater Clay Products Co.). U. S. 22,098, May 19, 1942 (March 30, 1942); reissue of U. S. 2,233,308, Feb. 25, 1941 (Sept. 16, 1940).

Method and apparatus for manufacturing pipe. E. K. HAMLEN (Robinson Clay Product Co.). U. S. 2,282,282, May 5, 1942 (Aug. 26, 1941).

Whiteware

Characteristic nature of the glaze of Japanese earthenware and porcelain: V. EIITI KOIZUMI. *Jour. Chem. Soc. Japan*, **62**, 559–61 (1941); *Chem. Abs.*, **35**, 7669 (1941).—Tables showing the results of the analysis of the wood ashes and straw ashes used in the glaze in the preparation of porcelain in the Fukui Prefecture are given. See *Ceram. Abs.*, **20** [10] 230 (1941).

Pottery research. MARCUS FRANCIS. *Trans. Brit. Ceram. Soc.*, **41** [1] 1–26 (1942).—F. reviews developments and research in the pottery industry. R.A.H.

Problem of improving the resistance to crazing by changing from raw to fritted glaze. ANON. *Keram. Rundschau*, **45** [51] 588–89 (1937).—Tests were made on five glazes, whose compositions are given. Crazing was decreased when the frit was used because larger quantities of sand could be introduced without changing the character of the glaze. M.V.C.

Resistance of pottery bodies to thermal shock: V, New method of determining damage to pottery bodies during cooling. AKIRO ITO. *Jour. Japan. Ceram. Assn.*, **47** [564] 611–15 (1939); *Chem. Zentr.*, **1940, I**, 2364–65; *Chem. Abs.*, **35**, 7669 (1941).—Round rods of seven different pottery bodies were used as test pieces. The strength modulus was determined before and after thermal shock. The test pieces were subjected to heating and cooling (water 6°) cycles. The temperature to which the pieces were heated was increased successively from 106° to 706°. Damage was measured by the decrease in the value of the modulus.

Saving on lead in pottery and whiteware glazes. ANON. *Keram. Rundschau*, **45** [34] 385–86 (1937).—Problems occurring in the production of lead-free glazes are dealt with. M.V.C.

Steatite and special ceramic materials, their development, application, and manufacture. A. GUNZENHAUSER. *Ceram. Ind.*, **37** [6] 41–46 (1941).—Steatite is a ceramic product containing talc as the chief ingredient. The manufacture of steatite articles originated in Germany; after World War I production started in France, England, Italy, and Switzerland. The development of high-frequency radio equipment brought about improvements in low-loss steatite materials. Some modern steatite plants in Europe have metal assembly departments connected with their ceramic departments and manufacture complete radio components. The usual forming methods for steatite manufacture are dry pressing, wet pressing, extruding, and casting. U. S. steatite plants turn out products equal in quality to those of European plants. Illustrated. H.T.

SEPARATE PUBLICATIONS

Staple Vitreous China Plumbing Fixtures. Recommended Revision of Commercial Standard CS20-42. Nat. Bur. Standards, April, 1942. 35 pp. Free.—The revision covers additional items including blowout and siphon-jet wall hanging water-closet bowls and wall hanging wash-out urinals as well as new boiling, crazing, and flushing tests and other changes to bring the standard into line with the latest recognized data and practices. See *Ceram. Abs.*, **9** [12] 1067 (1930). R.A.H.

Use of Washed North Carolina Kaolin as an Ingredient of Porcelain Bodies. WILLIAM H. EARHART. *Ohio State Univ. Eng. Expt. Sta. Circ.*, No. 42, 40 pp. (1941).—This investigation was undertaken to determine the feasibility of substituting North Carolina kaolin and other domestic clays for imported clays in porcelain bodies. For sanitary ware and electrical porcelain, the conclusions are as follows: (1) American kaolins and ball clays are satisfactory if used in the right combination; with any one kaolin, only certain ball clays may be used, and vice versa. (2) Ball clays, china clays, and kaolins may be classified as imparting low viscosity, intermediate viscosity, or high viscosity, when substituted individually in a standard body. (3) If the casting qualities of the individual clays are known, a test body of almost any desired casting properties may be compounded. (4) In bodies containing more than one ball clay, each exerts its influence on viscosity and rate of casting. (5) A direct replacement of a kaolin or china clay by another has less effect on the fired body color than a change in proportions. For hotel-china bodies, the conclusions are as follows: (1) Domestic kaolins and ball clays are suitable provided proper adjustments are made in the composition of the body. (2) Kamec kaolin gives higher dry and fired strength, equal translucency, and less vitrification and shrinkage than VC-1 English china clay. (3) Grinding of a body increases vitrification and shrinkage but not dry or fired strength. (4) Nepheline syenite is a more active flux than potash feldspar, and dolomite is a more active auxiliary flux than whiting. (5) The use of nepheline syenite and dolomite gives the desired vitrification, and an increase in flint gives the desired translucency, but no clays duplicate the high shrinkage of VC-1 English clay. (6) Other English clays of less shrinkage may be replaced by domestic clays. (7) Replacement of foreign clays in any particular hotel-china body requires individual consideration. The conclusions for vitreous floor tile are as follows: (1) Replacement by domestic clays requires 5% more feldspar and 5%

less kaolin. (2) Better vitrification and firing range are obtained when nepheline syenite is used to replace feldspar. (3) Nepheline syenite-Kamec bodies are better in color and warp less than bodies with feldspar and either Kamec or English clay. (4) Nepheline syenite-Kamec bodies are also more resistant to impact chipping. (5) Nepheline syenite-Kamec bodies are blue-white, feldspar-Kamec a slightly creamy white, and feldspar-English clay a creamy gray-white. See *Bull. Amer. Ceram. Soc.*, **19** [5] 163–68 (1940). W.D.F.

PATENTS

Bentonite product. JAMES MARSDEN (Canadian General Electric Co., Ltd.). Can. 404,506, May 5, 1942 (March 26, 1940). G.M.H.

Ceramic-to-metal seal. J. W. UNDERWOOD (General Electric Co.). U. S. 2,282,106, May 5, 1942 (July 14, 1939).—The method of forming a seal between a ceramic body and a metal body which comprises coating the ceramic body with a minor portion of a glaze which is substantially unaffected by a reducing atmosphere and which consists, by weight, of about 36 feldspar, 30 flint, 15 whiting, 13 clay, and 5 parts chromium oxide, and a major portion of a refractory metal in powder form, heating the coated ceramic body in a reducing atmosphere to a temperature above the fusing point of the glaze to produce an integral tightly adhering metal layer on the surface of the ceramic body, and soldering the metal-coated ceramic body to the metal body.

High resistance conducting coating for electric insulators. G. L. MCCREERY AND V. E. CAMPBELL (Ohio Brass Co.). U. S. 2,283,685, May 19, 1942 (Aug. 20, 1940).—An insulator having a high resistance conduction coating thereon, the coating comprising particles of magnetic iron oxide mixed with a fusible glassy material and having electrical contact with one another to provide electrical continuity while being protected from mechanical and electrical impairment by the fusible glassy material.

Rim-punching device. A. E. BENNETT (Crane Co.). U. S. 2,282,636, May 12, 1942 (Oct. 30, 1940).—A guiding device for use in perforating a closet-bowl rim while in the course of manufacture.

Self-hardening cement for spark plugs. KARL DIETZ AND FRANZ PRIVINSKY (Pen-Chlor, Inc.). U. S. 2,281,834, May 5, 1942 (April 17, 1939).—A self-hardening cement for spark plugs obtainable by mixing a cement powder with a water-glass solution, the cement powder containing as main constituent a chemically indifferent pulverulent substance identical with at least one of the substances of which the bodies to be cemented consist and having substantially the same coefficient of expansion as the parts to be cemented in admixture with small quantities of metal compounds which, on making up the cement powder with the water glass, react with formation of silicates which are infusible at the temperature of operation of spark plugs.

Spark plug. H. M. BREWSTER. U. S. 2,283,164, May 19, 1942 (May 31, 1940). C. SMITH. Brit. 544,637, May 6, 1942 (Aug. 29, 1939).

Spark plug. LAWRENCE A. HYLAND (Bendix Aviation Corp.). Can. 403,919 and 403,920, April 7, 1942 (Jan. 29, 1936). ALEXANDER L. ROBB (R & R Mfg. Co.). Can. 404,557, May 5, 1942 (Nov. 28, 1939; in U. S. Dec. 5, 1938). G.M.H.

Equipment and Apparatus

Agitation. Heat- and mass-transfer coefficients in liquid-solid systems. ARTHUR W. HIXSON AND SIDNEY J. BAUM. *Ind. Eng. Chem.*, **33** [11] 1433-39 (1941).—An equation is derived, expressing the rate of melting of the solid in a two-phase, single-component, liquid-solid system, based on the rate of heat transfer at the liquid-solid interface. This equation resembles the approximate integrated form of the cube-root law, and the surface coefficient of heat transfer, h, is comparable to the dissolution constant K. The equation correlating heat-transfer data for several liquids in a series of geometrically similar agitators is similar in form to the expression correlating data on mass transfer in the same equipment, and an analogy between heat and mass transfer in liquid-solid agitation systems is indicated. Applications of this analogy to studies of reaction kinetics are suggested. A method for correlating heat-transfer data in jacketed and coil-heated agitation vessels is proposed and confirmed by the data of King and Howard (*ibid.*, **29** [1] 75 (1937)) on heat transfer from a platinum wire in an agitated vessel. **Performance of propellers in liquid-solid systems.** *Ibid.*, **34** [1] 120–25 (1942).—Previously derived relations were applied to a study of the rate of dissolution of solids in liquids in a series of geometrically similar vessels fitted with propeller stirrers. It was found that the dissolution constant, K, for any particular liquid-solid system under isothermal conditions is a function of the product of the speed and size factor, nd, and this relation holds for several different agitator designs. The results for four liquid-solid combinations in propeller agitators over a temperature range of 6° to 45°C. are correlated by the equation

$$\frac{Kd}{D} = 3.5 \times 10^{-4}\left(\frac{nd^2\rho}{\mu}\right)^{1.0}\left(\frac{\mu}{\rho D}\right)^{0.5}.$$

The methods and results indicate the utility of model experiments in the prediction of agitator performance. **Power requirements of turbine agitators.** *Ibid.*, [2] 194–208.—The available literature on the power requirements of agitating equipment is reviewed and classified. A dynamometer is the most suitable apparatus for measuring power input to agitating equipment, and a turntable dynamometer is described for measuring the torque requirements of a rotating agitator. An equation for the power requirements of a series of dimensionally similar agitators is derived, and the experimental results are correlated with it. The curve obtained for any single agitator design is similar in shape to previously obtained fluid-flow curves and indicates the existence of a laminar flow region, a transition zone, a critical region, and a turbulent flow zone for agitating equipment. The limitations on the use of models for predicting power requirements are indicated by these curves. A standard turbine agitator design is established, and the effects of a single variation from this design on power requirements are investigated. An empirical method is developed for predicting the power requirements of other agitators which differ in more than one way from the standard design. Comparisons are made between predicted horsepower and measured horsepower for plant-size equipment; the predicted values compare favorably. Illustrated. See *Ceram. Abs.*, **20** [7] 174 (1941). F.G.H.

Amount and value of waste steam from steam engines, with regard to its utilization in the ceramic industry. ANON. *Sprechsaal*, **73** [48] 436–37 (1940).—Tables show the amount of waste steam and the heating surface required in boilers to produce steam of the same heating value. The cost of these boilers together with the costs for fuel and labor is given. W.H.H.

Brightness rating of metal surfaces measured by reflected light. A. M. SUGGS. *Product Eng.*, **13** [5] 253 (1942).—S. describes an instrument with which comparative measurements of the rate of tarnishing of metal or other surfaces can be made. The sample to be measured reflects light from a light source through color filters onto a photocell so that the measurement can be made in all spectral bands. To make an absolute measurement, a silver-backed glass mirror is used as a standard for reflection. The tarnish film in one sample had a distinct yellow cast, and the absorption was 8% greater for white than for yellow light. M.H.

Development of three-wing bits in the Tri-State District. S. S. CLARKE. *Amer. Inst. Mining & Met. Engrs.*

Tech. Pub., No. 1426; *Mining Tech.*, **6** [2] 5 pp. (1942).—In the Tri-State District, much drilling has to be done in chert, which shatters easily under impact but which is highly abrasive and causes rapid gauge wear. A detachable bit was sought that would complete one hole without sharpening and which could then be discarded. An improved four-wing bit was designed, but it showed only a little advantage over the older type. A three-wing bit was designed so that larger chips could escape and opposite wings would not bind in the hole. The average feet drilled per bit was slightly over 2 for the forged and the four-wing bits and 9.59 for the three-wing. The total bit cost per foot of hole was $0.083 for forged bits, 0.06 for four-wing, and 0.032 for three-wing. Using the three-wing bit for an entire hole without resharpening caused no loss of time. W.D.F.

Electrodrying of ceramic products. A. A. SHUMILIN. *Trudy Vsesoyuz. Inst. Ogneuporov*, **1939**, No. 17, pp. 3–32; *Chem. Zentr.*, **1940, I**, 2523; *Chem. Abs.*, **35**, 7668 (1941).—The molded pieces are connected as resistances in an a.-c. circuit. Resistance increases as drying progresses. The voltage is slowly increased to 220 volts. Formulas necessary for the calculation of the current and the amount of heat required are explained.

Examination of metals by ultrasonics. A. BEHR. *Metallurgia*, **23**, 7–11 (1940).—After a review of the development of ultrasonics in the last fifteen years, especially that in Russia, B. gives an account of the arrangement and use of apparatus for the nondestructive testing of metals by ultrasonics and compares the ultrasonic method of examination with the radiographic method. E.C.P.

Improved mercury balance volumeter. SIDNEY SPEIL AND HEWITT WILSON. *Jour. Amer. Ceram. Soc.*, **25** [10] 275–77 (June, 1942).—6 references, 3 figures.

Improvement and standardization of viscometers. W. RÖHRS AND W. K. ASBECK. *Fette & Seifen*, **47**, 443–46 (1940); *Chem. Abs.*, **36**, 1214 (1942).—The various viscometers used to measure time of outflow of resin and paint materials are discussed. The accepted DIN standard is described. If a metallic viscometer is dropped, the outflow nozzle may be dented and give erroneous results; one made of plastic will not be so dented.

Methods and instruments used in mineralogy. F. E. WRIGHT. *Amer. Mineralogist*, **27**, 145–54 (1942).—W. discusses the use of the reflecting goniometer, the petrographic microscope, and X-ray apparatus in mineralogy. W.D.F.

New all-glass mill. DAVID B. PALL. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 346–48 (1942).—A new mill has been developed by means of which inks and paints over a wide consistency range can be thoroughly ground without contamination. This apparatus consists essentially of two truncated glass cones, one of which is fitted inside the other, together with a plunger feed mechanism which forces crudely mixed ink into the annular space between the conical sections, one of which is rotated with respect to the other. For example, the outer section of a ground-glass joint is fitted with a plunger at the small end, and ink is forced by a rotating appropriately slotted stopper. The efficiency of this mill has been tested relative to that of a laboratory 4 x 8 in. three-roller mill as well as that of hand milling. Advantages include excellent dispersion and freedom from metallic contamination with whites and light colors. Illustrated. F.G.H.

Novelties in the field of safety devices. ANON. *Sprechsaal*, **73** [47] 423–26 (1940).—Various devices are described and illustrated. Moving of freight cars inside a plant is a frequent cause of accidents. A car mover mounted on one rail which can be operated by one man is available. Danger from loading sacks is diminished when they are supported by wide bands instead of ropes. Electric trucks are provided with a seat for a passenger, as well as the special place for the operator. Overhead buckets traveling on rails, for transporting coal, sand, clay, etc., are often dangerous because they open unexpectedly. This is prevented by a new safety device. Portable steps are safer than ladders but are limited to smaller differences in elevation. The upper end of steps or ladders should preferably be held in position. In an improved form of wash bottle, the pressure is applied by a rubber bulb. Care should be taken in the selection of sandblast masks and other masks for protection against dust, as many on the market are unsuitable. An improved bung for a barrel is arranged to relieve the pressure before the bung is removed. W.H.H.

Reflectometer and a study of its performance. EUGENE C. BINGHAM AND DANIEL FIGLIOLI. *Paper Trade Jour.*, **113** [23] 32–37 (1941); *Chem. Abs.*, **36**, 685 (1942).—The instrument is a multiangle reflectometer in which the diffuse reflection at a given angle from the sample and from a standard white substance are compared by the use of polaroids and photoelectric cells. The ratio of the light received from the sample to that received from the standard under the same conditions is taken to be the specific reflectance of the instrument.

Rotary viscometer for determination of high consistencies. R. N. TRAXLER, J. W. ROMBERG, AND H. E. SCHWEYER. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 340–44 (1942).—The design, construction, and operation of a new rotating cylinder viscometer are discussed. Its application to rheological studies is illustrated by results for asphalts over a range of 0.0001 to 1000 megapoises. Novel features of the instrument comprise corrections for both top and bottom end effects and a special design whereby the viscosity is measured at a constant mean rate of shear. The apparatus is particularly adaptable for measurement of equilibrium consistency and for studies of complex flow and the elastic properties of materials having relatively high viscosities. Illustrated. F.G.H.

Shrinkage during drying dependent on the water content of a clay. ANON. *Ziegelwelt*, **71**, 379–80 (1940); abstracted in *Chem. Zentr.*, **1941, I**, 1458.—When shrinkage which occurs during drying is fully completed, the drying temperature can be sharply increased providing care is taken that no detrimental vapor tensions occur. M.V.C.

SEPARATE PUBLICATION

Thermal Expansion of Solids. *Nat. Bur. Standards Letter Circ.*, No. 679, 25 pp. (Feb., 1942). Free.—All reports dealing with apparatus for determining the thermal expansion and materials tested for expansion are listed. R.A.H.

PATENTS

Apparatus for feeding clay to molds in the manufacture of pottery ware. W. J. MILLER. U. S. 2,282,372, May 12, 1942 (March 20, 1936; Aug. 13, 1940).

Mold-filling apparatus. F. A. MCCANN (Pacific Clay Products Co.). U. S. 2,284,332, May 26, 1942 (Aug. 16, 1941).

Tank-filling nozzle. F. G. THWAITS (Heil Co.). U. S 2,284,350, May 26, 1942 (Aug. 19, 1939).

Tile-cutting machine. C. A. MARTIN. Can. 403,158, March 3, 1942 (Oct. 26, 1940; in U. S. Dec. 18, 1939). G.M.H.

Kilns, Furnaces, Fuels, and Combustion

Adjustments to pulverized coal burners required by various coals. F. G. ELY. *Concrete, Cement Mill Ed.*, **50**, 140–42 (1942).—The burning of pulverized coal has done much to reduce differences between coals. Coals still differ, however, in (1) surface moisture, (2) grindability, (3) volatile and fixed carbon proportions, and (4) fusing characteristics of the ash. (1) Excess surface moisture should be avoided by protecting the coal from the water; if water is present, care should be taken to keep the coal flowing to the pulverizer and to maintain a temperature at the pulverizer outlet which will dry the coal. (2) Variations in grindability may be overcome partially by

more pressure on the grinding units or by a larger pulverizer. Coarse coal should be avoided. (3) High volatile coals (30 to 40%) are most readily burned in suspension. For lower volatile coals the secondary air, primary air, and coal should be hotter, and a richer mixture should be used. (4) Ash causes complicated and diverse problems. Coal ash is not a uniform mixture. The state of oxidation of the iron is important; FeO is a flux while Fe_2O_3 is a refractory. W.D.F.

Controlled atmosphere generators. E. E. Slowter and B. W. Gonser. *Metal Progress*, **39** [5] 560–66, 628 (1941).—Equipment necessary for the production of nitrogen obtained by burning fuel gas and removing the CO_2 and H_2O from the burned gas is described. A flow sheet is shown. Nitrogen may thus be produced for 27¢ per M cu. ft. exclusive of depreciation costs. Other types of gas atmospheres for annealing purposes include (1) CO and N_2, produced by the combustion of carbon; (2) CO, H_2, and N_2, resulting from partial combustion of natural gas and air; (3) gas-engine exhaust; and (4) flame annealing, in which the material to be annealed passes through the nonoxidizing position of the flame. B.C.R.

Determination of ash in coals unusually high in calcite and pyrite. O. W. Rees and W. A. Selvig. *Ind. Eng. Chem., Anal. Ed.*, **14** [3] 209–12 (1942).—This paper is a report of cooperative work done by the Analytical Laboratory of the Illinois State Geological Survey and the Pittsburgh Laboratory of the U. S. Bureau of Mines for the purpose of studying modified procedures for the determination of ash in troublesome coals. In determining ash in coals containing unusually large amounts of calcite and pyrite, difficulty may be experienced in obtaining satisfactory results by the standard A.S.T.M. procedure because of the varying amounts of sulfur that are retained as calcium sulfate in the ash. Variations in the heating procedure used in the ash determination influence the amount of sulfur retained. Lower ash and lower sulfur in the ash are obtained by slow rates of heating. F.G.H.

Determining the fusain content of Illinois coals. Comparison of chemical and petrographic methods. B. C. Parks, G. W. Land, and O. W. Rees. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 303–305 (1942). F.G.H.

Electrically operated flue-gas analyzer. Anon. *Sprechsaal*, **73** [45] 403–404 (1940).—The efficiency of firing is indicated by the excess of air, which must be at least 1.3 to 1.5 times the theoretically required amount. Excess air causes loss of fuel; it is wasted in heating the air. Too little air is wasteful as it causes incomplete combustion. Determination of the amount of CO_2 is insufficient; the determination of the CO + H_2 content is also necessary. For firing steam boilers, the CO_2 content should be 12 to 14%, and the flue gas should be as free from CO + H_2 as possible. With the new electrically operated analyzer, the content of both CO_2 and CO + H_2 is continuously recorded. In measuring CO_2, a platinum wire carrying an electric current attains a temperature and electrical resistance dependent upon the CO_2 content of the flue gas. A second wire is exposed only to atmospheric air, and the difference in resistance of the two wires operates the recorder. In the apparatus for measuring CO + H_2, an increase in the temperature of a platinum wire is due to the burning of the combustible constituents of the flue gas, and this increase in temperature is used to operate the recorder in a manner similar to that used to operate the recorder in the CO_2 apparatus. Air is supplied to insure complete combustion. The flue gas is purified by a porous self-cleaning filter of ceramic material and is cooled before being pumped or drawn to the analyzer. The analyzer requires a direct current of 6 volts. The CO_2 meter requires 0.3 to 0.4 amp., and the CO + H_2 meter uses 0.8 to 0.9 amp. See *Ceram. Abs.*, **18** [7] 190 (1939). W.H.H.

Experiments with an insulating wall for stoves and refrigerators. F. Platè. *Alluminio*, **9**, 123–25 (1940); abstracted in *Chem. Zentr.*, **1941, I,** 1862.—The insulating wall tested was made of Eternite with corrugated layers of Eternite between the outer walls; the empty spaces were filled with Alfol. The single outer Eternite wall is insulated with plating (Cel-Bes) and Al (1 mm. thick). This insulating wall can be used for temperatures up to 400°. The thermal conductivity for a thickness of 71 mm. was determined under laboratory conditions at 0.125 Cal. per m. hr. °C. at 100°. M.V.C.

Measurement of flame temperature by spectral reversal method using photography. K. Kinosita and Arita-Kenzi. *Proc. Phys. Math. Soc. Japan*, **23,** 646–63 (Aug., 1941); *Science Abs.–A*, **45** [530] 53 (1942).—An attempt was made to determine the reversal temperature more accurately by microphotometric analysis of photographic records, but difficulty was experienced on account of fluctuations in flame temperature. The analysis shows the *D* lines to be 0.5 to 1.5 a.u. in width with an indentation in the center of each emission line due to self-absorption by the cooler outer edges of the flame. The nature of the record consistent with a reversal due to the hottest temperature of the flame is determined, and the photographic method is thought to be capable of high accuracy provided the flame temperature remains constant. H.K.R.

Solving the problem of low-cost kilns for the small pottery producer. Anon. *Ceram. Ind.*, **37** [6] 82 (1941).—A specially designed 43-ft. tunnel kiln at the Pioneer Pottery fires one-fire ware to 2100°F. H.T.

SEPARATE PUBLICATION

Index of Coals Tested in the Bureau of Mines Survey of Carbonizing Properties of American Coals. James E. Wilson and Joseph D. Davis. *U. S. Bur. Mines Tech. Paper*, No. 637, 10 pp. Supt. of Documents, Govt. Printing Office, Washington, D. C. Price 5¢. R.A.H.

Geology

Acidity of Japanese acid clay: I, Various theories concerning the mechanism of the acidity of Japanese acid clay. Ken-iti Yamamoto. *Waseda Applied Chem. Soc. Bull.*, **17,** 13–20 (in English, p. 38) (1940); *Chem. Abs.*, **34,** 2673 (1940).—Japanese acid clay is generally acid to indicators such as litmus, methyl orange, and phenolphthalein when brought into contact with them. A clear solution which is filtered from a suspension of Japanese acid clay treated with distilled water contains no perceptible H ion, and the similar clear solution obtained from suspension of Japanese acid clay which is treated with neutral salt solutions such as NaCl solution contains distinctly free H ion. Theories which have been published in Japan for these phenomena are discussed. **II, Reaction toward indicators and acidity of Japanese acid clay.** *Waseda Applied Chem. Soc. Bull.*, **17** [2] 45–47 (1940); *Chem. Abs.*, **35,** 1189 (1941).—A few cubic centimeters of solution of methyl orange, litmus, or phenolphthalein are mixed with an aqueous suspension of sample clays obtained from various localities in Japan, and the mixture is allowed to stand for several hours. The clear top solution remains colorless, whereas the sediment becomes pink. No perceptible H ions are extracted from clay. Furthermore, absence of colloidal precipitate in the mixture indicates that Al, Fe, Ca, and Mg ions are not extracted from the clay. The clear top solution, isolated from the precipitate, gives an acid reaction when treated with NaCl, whereas the precipitate is neutral; this indicates that the solid phase is not acidic. The top solution has a pH of 5 to 6, equal to H_2O used in the experiment, and the suspension, treated with saturated KCl, has a pH of 4 to 5. **III, Components extracted from the acid clay treated with neutral salt solutions.** *Waseda Applied Chem. Soc. Bull.*, **17** [3] 100–10 (in English, pp. 133–34) (1940); *Chem. Abs.*, **35,** 4655 (1941).—The amount of components extracted from the acid clay treated with KCl solution was determined. A dried sample (20.3530 gm.) of a highly acidic variety of clay was agitated with 200 cc. of 1 *N* KCl solution in a 400-cc.

bottle for 5 hr. at 25°. The clay suspension was filtered, and the residue was mixed with 200 cc. of fresh KCl solution and treated again. This process was repeated until all the recognizable components were extracted from the clay. The filtrates were collected and analyzed. The extracted components were Al, Fe, Ca, and Mg ions and a relatively large amount of soluble SiO_2. The total amount of extracts was only 0.6% by weight of the original clay. Al ion was extracted from acidic clay and never from neutral or alkaline clay; this fact indicates that the acidity of the acid clay is due to Al and Fe ions. **IV, Components extracted from the acid clay treated with neutral salt solution and diminution of cation in the solution.** *Waseda Applied Chem. Soc. Bull.*, **18** [1] 1–3 (in English, p. 28) (1941); *Chem. Abs.*, **35,** 5015 (1941).—BaCl solution of varying concentration was mixed with acid clay and held at 25° for 120 min. The solution was then filtered, and the acidity of the filtrate was determined by titration. The loss of Ba ion from the solution during treatment and the loss of Al ion from the clay were determined. There was no correlation between the two. Freundlich's adsorption isotherm, however, expressed the relation between the amount of Ba ion absorbed by the clay and the final concentration of $BaCl_2$ in the solution. It was considered, therefore, that the cations of the neutral salt were adsorbed by the acid clay. **V, Aluminum compounds in acid clay and considerations on acidity from the essential part of the acid clay.** *Waseda Applied Chem. Soc. Bull.*, **18** [1] 3–6 (in English, pp. 29–30) (1941); *Chem. Abs.*, **35,** 7668 (1941).—Repeated treatment of acid clay with dilute HCl of less than 0.005 *N* at 40° until all the Al and Fe compounds are extracted has shown that the extractable Al and Fe compounds are less than 1% and that an inflection point exists in the extraction curve of Al compounds. Results indicate that (1) Al compounds in acid clay are in 2 solid forms, a relatively soluble form and $Al_2O_3 \cdot 4SiO_2 \cdot H_2O$ which forms the frame of the clay to which amorphous hydrated SiO_2 is attached, forming an active surface that determines the adsorptive value of the clay; (2) X-ray diffraction lines are independent of acidity; and (3) optical properties have no relation to adsorptive action of the clay toward mineral oils. The acidity of the acid clay evidently depends upon the soluble Al compounds and not on the main crystalline components.

Additional notes on the final grinding of petrographic thin sections. A. F. FREDERICKSON. *Amer. Mineralogist*, 27, 58–60 (1942).—Spread a little abrasive on about 1 sq. in. of the glass plate and wet. For a wedge-shaped section hold the slide with the thumb and second finger and use only the index finger for pressing down on the high side; move the slide forward, and do not grind on the return stroke or rotate the slide. For sections thick in the center, follow the same directions but press on the thick place. For slides very thin on one edge, apply a thin film of balsam as a protection. W.D.F.

Alunite from Beregszász. Z. SCHRÉTER. *Földtani Közlöny*, **69,** 10–25 (1939).—S. describes the alunite mines of Derekaszeg, Virágberg, Szarvasbányák, and gives chemical analyses. W.N.

Bauxite deposits and statistics of European countries (also Brazil). ANON. *U. S. Bur. Mines Mineral Trade Notes*, **13** [3] 2–5; [4] 2–5 (1941).—Germany manufactures aluminum from imported ore exclusively. Denmark does not mine bauxite or manufacture aluminum but controls the cryolite supply in Greenland. Norway has no bauxite deposits but has an important aluminum industry through smelting French bauxite. Bauxite deposits are unknown in Sweden, but Hungary is one of the most important sources in the world; Yugoslavia also has extensive deposits. France is the foremost world producer of bauxite; Greece has fairly extensive deposits but only those in the central portion are being worked. Italy has scattered reserves of only 10,000,000 tons. The market price of $6 per ton in the U. S. is a deterrent for bauxite shipments from Brazil as the present freight rate is $15 per ton. R.A.H.

Bentonite, its properties and applications. F. GRUBER. *Bull. Mat. Grasses Inst. Colonial Marseille*, **25,** 91–97 (1941); *Chem. Abs.*, **35,** 7663 (1941).—G. reviews the physical and chemical properties of bentonites and their identification and classification, as well as commercial applications. French (North African) bentonites are compared with similar American and Italian products.

Ceramic raw materials and their origin. RUDOLF HUNDT. *Ziegelwelt*, **71,** 384–85 (1940); abstracted in *Chem. Zentr.*, **1941, I,** 1457.—Kaolin and clay (loam, loess, and clay slate) and their uses are discussed. The distribution of clay in single formations is dealt with. M.V.C.

Chemistry and technology of kaolin, with special consideration of its use as a filler. R. SCHMUCKER AND H. RADLER. *Fette & Seifen*, **47,** 213–18 (1940); *Chem. Abs.*, **35,** 7664 (1941).—Data on the formation, occurrence, production, and physical and chemical properties are given. 16 references.

Chromite. A. C. SKERL. *Econ. Geol.*, **37** [2] 153–54 (1942).—The geology of the chromite deposits in the Zambales field (Philippines) is discussed briefly. This deposit contains about 10 million tons of refractory ore at the Masinloc Mine and 600,000 tons of metallurgical and chemical ore at the Acoje Mine. A new deposit in the Province of Misamis is being developed. See "Philippine . . . ," *Ceram. Abs.*, **20** [1] 29 (1941). B.C.R.

Chromite in the Philippines. W. F. BOERICKE. *Eng. Mining Jour.*, **142** [11] 38–40 (1941).—About half the tonnage shipped is ore containing less than 35% chrome or the so-called refractories ore. The other half is ore containing over 48% Cr_2O_3 and is the metallurgical grade if it meets other specifications. This ore tends to run too high in iron and to be too friable. Most of the ore comes from the Zambales district, Luzon; other deposits are in Dinagat and Mindanao. It is usually found as chromite lenses in peridotite. At Masinloc is a high-alumina chrome-spinel deposit containing 10 million tons. The ore is used for refractories, and about 200,000 tons will be shipped to the U. S. in 1941. The future of Philippine chromite is uncertain. See "Philippine . . . ," *Ceram. Abs.*, **20** [1] 29 (1941). W.D.F.

Comparative determination of plasticity of clays by the Atterberg and Volarovich methods. S. M. YUSUPOVA AND M. P. VOLAROVICH. *Kolloid. Zhur.*, **6,** 387–93 (1940); *Chem. Abs.*, **35,** 7133 (1941).—The plasticity of eleven clays was determined by the Atterberg and the Volarovich ("Application. . .," *Ceram. Abs.*, **16** [4] 133 (1937)) methods. The methods gave parallel results though different in absolute values. The Atterberg method is recomended for commercial use and the Volarovich method for more accurate work.

Conditions for the formation of paragonite. JOHN W. GRUNER. *Amer. Mineralogist*, **27,** 131–34 (1942).—Paragonite, the sodium equivalent of muscovite, was formed hydrothermally in a bomb containing acid at 400°C. It was identified by X-ray powder photographs. Paragonite is more rare than muscovite, probably due to the smaller size of the sodium ion which will only substitute for the potassium ion under special conditions. W.D.F.

Crystal chemistry of the silicates. I. NÁRAY-SZABÓ. *Jour. Hungarian Chem. Soc.*, **1** [3] 1–4 (1940); *Chem. Abs.*, **35,** 7259 (1941).—A review is given of the development of crystal chemistry in general and of the structure of the silicates in particular, with a description of the theories of Haüy, Bravais, Laue, Goldschmidt, and Bragg.

Determination of the composition of feldspars from their densities. T. E. KRASENSKAYA. *Metody Issledovaniya Keram. Materialov*, **1939,** 181–86; *Khim. Referat. Zhur.*, **1940,** No. 2, p. 66; *Chem. Abs.*, **36,** 1267 (1942).—The density of a feldspar is determined by using a series of heavy liquids and comparing their densities with those of several uniform bits of the sample. The chemical composition of the feldspar is determined from a table of densities and the corresponding chemical compositions of feldspar. Methods for preparing a number of heavy liquids are described.

Determining the surface area of powdered materials from granulometric analyses. H. ZUR STRASSEN AND W. STRÄTLING. *Tonind.-Ztg.*, **64** [27] 181–84; [29] 199–200; [30] 207–208 (1940).—Three graphical methods of deter-

mining surface area from granulometric analyses are compared. The first method has been outlined by A. O. Gates ("Crushing surface diagram," *Eng. Mining Jour.*, **95,** 1039 (1913)). The reciprocal indication line is the function $G \times 1/D$, where G = total weight and D = diameter of grains. It is used as the measure of surface. The second method (N. Liatsikas, *Intern. Mitt. Bodenkunde*, Vol. 3/6 (1924)) uses in principle the same graphical method, but the integral of the area is represented by polar instead of rectangular coordinates. The third method (S. Odén, "New method for the determination of granular distribution in suspensions," *Kolloid-Z.*, **18,** 33–48 (1916)) does not lead directly to a function of surface and weight, but use is made of an intermediate step, the "granular-size distribution diagram." It determines the distribution of the total weight over the various sizes; mathematically, it is the differential of the indication diagram. E. Bierbrauer and F. Honig ("Understanding of separation of solid materials," *Zement*, **24,** 284–90 (1935)) discussed the mathematical equation of the conception, "grain distribution." Grain classes are defined as equal divisions of the total diameter area and are based on the geometrical principle of division. This was applied only to weight distribution, but the first method of the reciprocal indication line was used for representation of surface area. The experimental results are given. Tests were carried out on calcined Zettlitz kaolin at eight calcining temperatures between 400° and 1100°C. The pipette method was used after elutriation. Grain sizes were determined according to Stokes' law. Before the analysis was made, the test samples were prepared according to the standard method of Odén in order to obtain complete separation of particles. From the test results, logarithmic indication curves, particle-size distribution curves, surface-area distribution curves, and reciprocal indication curves were plotted. Raw kaolin has an even grain-size distribution over a wide area. Heating to 400°C. causes conglomeration of particles with a maximum at 2.2 μ. Further heating causes sintering of the finest particles toward a maximum of 2.7 μ. Further increase in firing temperature does not change the grain-size distribution. The surface-area curves show that, up to 500°C., a considerable decrease of surface area takes place, but there are no further changes at higher temperatures. The surface area of Zettlitz kaolin heated between 110° and 1100°C. is given in cm.² per gm., changing from 34,000 cm.² per gm. at 110° to 5800 cm.² per gm. at 1100°C. The results obtained are compared with those of other investigators. The surface-area values are compared with wetting heat and heat tone obtained by bringing the products of calcination in contact with water and limewater. Neither thermal measurements nor granulometric analyses alone give a true picture of the change of surface area; both methods must be used together for a true picture of the surface development of kaolin and its products of calcination. H.T.

Diatomite from northeast Brazil. S. Froes Abreu. *Rev. Chimica Ind.*, **9** [96] 15–16 (1940); abstracted in *Chem. Zentr.*, **1941, I,** 1722.—Diatomite from the northeastern states of Brazil (Ceará, Rio Grande do Norte) is a first-class insulating material for furnaces, steampipes, and buildings but is less adapted to filtration purposes. The properties and previous development of the deposit are described. See "Kieselguhr. . .," *Ceram. Abs.*, **20** [6] 156–57 (1941). M.V.C.

Djalmaite, a new radioactive mineral. Caio Pandia Guimaraens. *Ann. Acad. Brasil. Sci.*, **11,** 347–50 (1939); abstracted in *Chem. Zentr.*, **1941, I,** 1272.—Djalmaite contains 72.27% Ta_2O_5, 1.41 Nb_2O_5, 2.54 TiO_2, traces of SnO_2, 0.80 ZrO_2, 2.17 UO_2, 9.38 UO_3, 0.18 WO_3, 0.98 Bi_2O_3, 1.10 PbO, 0.56 FeO, 3.40 CaO, 0.24 MgO, and 4.62 H_2O; density 5.75 to 5.88; cubic symmetry; octahedral habitus. The mineral is closely related to betafite and eschwegeite and is classified in the pyrochlorine group between microlite and hatchettolite. The mineral was named for the Brazilian petrographer and mineralogist, Djalma Guimaraes. M.V.C.

Examination of natural rocks with regard to their resistance to frost and weather. H. Breyer. *Z. Deut. Geol. Ges.*, **90,** 275–84 (1938).—The importance of observations over a long period of time is emphasized. W.N.

Further studies of the lepidolite system. A. N. Winchell. *Amer. Mineralogist*, **27,** 114–30 (1942).—Analyses of 28 members of the lepidolite system were used. The three end members chosen were polylithionite, $K_2Li_4Al_3Si_6O_{20}F_4$; protolithionite, $K_2LiFe_4Al_3Si_6O_{20}F_4$; and a previously unnamed composition now called paucilithionite, $K_2Li_3Al_5Si_6O_{20}F_4$. The calculation of the 28 analyses to these three end members shows a deficiency of Li_2O in nearly every case. The only satisfactory explanation is that muscovite crystallizes interleaved with the lepidolite but not in crystal solution in it. If this is so, measurement of the optical properties of more than one flake from a homogeneous-appearing sample of lepidolite should show a variation from the optical properties of muscovite to those of lepidolite. This was done on most of the 28 samples, and these variations are shown to actually exist. W.D.F.

Genetic relation of zircon and zirconium silicates in alkaline rocks. E. E. Kostyleva. *Izvest. Akad. Nauk S. S. S. R., Ser. Geol.*, **1940,** No. 2, pp. 118–24; *Chem. Abs.*, **35,** 7328 (1941).—An excess of R_2O over Al_2O_3 does not always determine the formation of Zr silicates instead of zircon as well as the agpaite form of crystallization. The nepheline syenites of the Mariupol Zr deposits (Ukraine) having R_2O greater than Al_2O_3 contain only zircon, while in the Lovozero tundras where $R_2O < Al_2O_3$ the agpaite form of crystallization is observed. The chief cause of the crystallization of both is the considerable amount of volatile matter in the magma.

Industrial minerals and the war effort. W. B. Timm. *Can. Mining & Met. Bull.*, No. 361, pp. 181–91 (1942).—Canada is having difficulty in obtaining supplies of some of its deficient minerals, and, as there is little likelihood of any real improvement in the situation, every effort must be made to obtain the greatest possible degree of self-sufficiency in respect to mineral supplies. Canada's production of fluorspar, graphite, and china clay and of ores of tungsten, chromium, and manganese is far short of the requirements. There is no domestic production of piezoelectric quartz or of Iceland spar. There are many occurrences of molybdenite, but all that produced comes from Quyon, Quebec. The entire Canadian output of chromite comes from the eastern townships of Quebec, and considerable interest is being shown in deposits of that province. There are many deposits of manganese ores in the Maritime Provinces. These are mostly low grade, and production is small. Canada has enough of most of the refractory minerals but imports most of the fire clay used in eastern Canada, most of its chromite, and part of its magnesium refractories. The chief domestic source of magnesium refractories is in Quebec. There are abundant supplies of the fluxing minerals with the exception of fluorspar, of which there is a small domestic production in Ontario and Nova Scotia. There is a large output of asbestos in the eastern townships. Barite is produced in Nova Scotia, with a smaller production in British Columbia. Some bentonite of the high-swelling type is produced in the western prairies. There is no production of celestite or of cryolite. Some graphite is produced near Calabogie, Ontario. Supplies of limestone are abundant, and there is sufficient production. Lithium minerals occur in Manitoba but are not developed. Ontario and Quebec have an important output of amber mica. Talc and soapstone are produced in Ontario and Quebec. The Dominion Government Department of Mines and Resources is giving every assistance in the work of bringing into production deposits of minerals required for the war effort. G.M.H.

Investigation of grain-size distribution. Soren Berg. *Ingeniøren*, **49** [59] 81–84 (1940); abstracted in *Chem. Zentr.*, **1941, I,** 1862–63.—For determining the grain-size distribution in suspensions, a device called a "dip weight" was used, which comprises a glass float sealed to a point at both ends and loaded at one end with magnetic filling and a little rod reaching almost to the center and having a disk at one end. The smallest floats are spherical, have a

diameter of 7 mm., and contain a small wire coil. The magnetic filling serves to draw the float to the wall of the container by a magnet. Comparative measurements of suspensions of blue clay, heavy spar, and ground porcelain are given which show the use of the method in the gravitational and centrifugal fields; the results agree with those obtained by other processes. The theory of the rectilinear course of the curve of distribution at its beginning (Andreasen) was confirmed. Even very small temperature changes may affect local systems of convection flows in thin suspensions. M.V.C.

Lithium chloride from lepidolite. GEORGE O. G. LÖF AND WARREN K. LEWIS. *Ind. Eng. Chem.*, **34** [2] 209–16 (1942).—The reaction between gaseous hydrogen chloride and pulverized lepidolite at elevated temperatures was investigated to determine the conditions required for a high recovery of lithium chloride. At temperatures approaching the melting point of the ore (about 935°C.), lithium chloride could be distilled from the lepidolite and recovered in condensed solid form. At these temperatures and at reaction times approaching 13 hr., essentially complete recovery of the lithium in the ore was obtained. The effects on the lithium yield of variation in temperature, reaction time, hydrogen chloride rate, quantity of ore, fineness of division of ore, and dilution of hydrogen chloride with air and water vapor were investigated. It was concluded that, at high hydrogen chloride rates, the reaction rate was the controlling factor at the start of the heating period; after 1 to 3 hr., however, the diffusion of the reaction products from the ore particles controlled the production of lithium chloride. The hydrogen chloride requirements of the process were calculated; a large excess of the gas is required, which necessitates a recycling system if economical operation is to be obtained. Illustrated. F.G.H.

Minor constituents in spodumene. ALTON GABRIEL, MORRIS SLAVIN, AND H. F. CARL. *Econ. Geol.*, **37** [2] 116–25 (1942).—Spodumene ($LiAl(SiO_3)_2$) of high purity was examined spectrographically for minor impurities. All 11 samples from 8 localities (North Carolina, New Mexico, California, South Dakota, and Maine) showed iron, manganese, titanium, gallium, sodium, and potassium; 9 showed tin, and 1 rubidium. X-ray and petrographic studies indicate that the impurities are present in spodumene itself, probably as isomorphous replacements. The iron and other objectionable impurities may be present in sufficient amounts to limit their use in the ceramic field. The X-ray powder-diffraction pattern for spodumene is given. B.C.R.

New data on hetaerolite, hydrohetaerolite, coronadite, and hollandite. CLIFFORD FRONDEL AND E. W. HEINRICH. *Amer. Mineralogist*, **27**, 48–56 (1942).—Hetaerolite, $ZnMn_2O_4$, is isostructural with hausmannite, $MnMn_2O_4$. The hetaerolite described by Palache in 1928 is identical with the original mineral. The so-called hetaerolite described by Palache and Schaller in 1910 agrees with hydrohetaerolite from Leadville. This hydrohetaerolite differs from hetaerolite in cell dimensions, in its fibrous character, in lower indices, and in that it contains a little SiO_2 and H_2O; its status as a mineral is uncertain. Coronadite, $MnPbMn_6O_{14}$, is a valid species and is isostructural with hollandite, probably $MnBaMn_6O_{14}$; X-ray powder study suggests that they are only pseudotetragonal. Psilomelane with 17% BaO and hollandite are distinct species. W.D.F.

Properties of soils from the loam pits of brickworks in Vnorov. JOSEF MATĚJKA. *Stavivo*, **21**, 43–46 (1940); abstracted in *Chem. Zentr.*, **1941, I**, 1458.—The composition, impurities, and technological ceramic properties were studied. M.V.C.

Some minerals from southern California. JOSEPH MURDOCH AND ROBERT W. WEBB. *Amer. Mineralogist*, **27**, 323–30 (1942).—At the Defiance mine, Darwin, Inyo County, the primary minerals are calcite, fluorite, galena, and pyrite; the secondary minerals are anglesite, aurichalcite, calcite, fluorite, hemimorphite, hydrozincite, limonite, linarite, malachite, and wulfenite. Orthoclase phenocrysts, usually twinned, from near Cinco are as good or better than those from Goodsprings, Nevada. They occur in rhyolite dykes. Hemimorphite crystals occur in the Lead Hill mine, Barstow, together with calcite and a barite gangue. Sapphire blue corundum not of commercial grade occurs in the San Jacinto Mountains near Banning. In Red Rock Canyon of the El Paso Mountains, analcite, natrolite, calcite, quartz, jasper, chalcedony, and some opal are found in cavities in basalt. W.D.F.

Sorption of water vapor by vermiculite and its silica. Equilibrium measurements. L. A. SPITZE AND L. A. HANSEN. *Ind. Eng. Chem.*, **34** [4] 506–508 (1942).—By the use of a McBain-Bakr sorption balance, isotherms were obtained at 25°, 45°, and 65°C. for the sorption of water vapor by vermiculite, exfoliated vermiculite, and the silicas prepared from these materials. Definite hysteresis was observed in the isotherms for the silicas but was absent in those of unexfoliated and exfoliated vermiculite. The hysteresis effects as well as differences in the shapes of the isotherms for the various materials can be explained on the basis of the cavity concept proposed by McBain. The data for the unexfoliated vermiculite fits the Langmuir equation. Using the Langmuir equation, inversion points are found in isotherms for the exfoliated vermiculite and the two silicas, which indicate that in the case of these materials capillary condensation takes place at the higher pressures. Illustrated. F.G.H.

Spodumene and its associated minerals from the Ooregum mine, Kolar gold field. B. RAMA RAO AND M. B. RAMACHANDRA RAO. *Records Mysore Geol. Dept.*, **37**, 38–42 (1939); *Mineralog. Abs.*, **8**, 86 (1941); *Chem. Abs.*, **35**, 7323 (1941).—Optical data and an analysis of pale green spodumene are given. Associated minerals in pegmatite are lithiophilite, native As, apatite, tourmaline, and beryl.

Tables for the identification of ore minerals by X-ray powder patterns. G. ALAN HARCOURT. *Amer. Mineralogist*, **27**, 63–113 (1942).—The powder diagrams for 169 ore minerals are listed, showing the spacing in angstrom units and the relative intensity of each line. A table of the minerals arranged according to the spacing of the strongest line of each mineral is presented. W.D.F.

Tridymite problem. JOSEPH LUKESH. Read before Crystallographic Society; abstracted in *Amer. Mineralogist*, **27**, 143–44 (1942).—Crystals of impure tridymite from Plumas Co., Calif., have a *c* axis twice the length of that of crystals of other tridymite. They invert directly to the high form at 127°C. The approximate empirical composition is $NaCaAl_3Si_{15}O_{36}$. A purer tridymite from San Cristóbal, Mexico, showed two inversions, at 121°C. and at 135°C. None of these inversions was reversible. Both tridymites when heated showed changes in their X-ray patterns due to the migration of impurity atoms from positions satisfying only electrostatic forces to positions more compatible with packing requirements. These were also irreversible. The Plumas Co. tridymite must have been formed below 127°C., and the other below 121°C. W.D.F.

SEPARATE PUBLICATIONS

Chalk and Whiting. OLIVER BOWLES. *U. S. Bur. Mines Information Circ.*, No. 7197, 21 pp. Free.—Definitions for chalk and whiting and their uses are given. Specifications, production, occurrences in the U. S., processes of manufacture, tariffs and imports, and a selected bibliography are included. R.A.H.

Chromite Deposits of Kenai Peninsula, Alaska. P. W. GUILD. *U. S. Geol. Survey Bull.*, No. 931-G, 36 pp. Supt. of Documents, Govt. Printing Office, Washington, D. C. Price 50¢.—Chromite deposits occur at the south end of Kenai Peninsula, Alaska, in two areas, Claim Point and Red Mountain. They are contained in masses of ultramafic rocks. Dunite is the predominant intrusive; pyroxenite, garnet pyroxenite, and serpentine derived from the alteration of dunite are also present. The ore deposits are parts of the dunite and serpentine masses in which chromite has been concentrated by magmatic concentration. These deposits are tabular, strongly banded bodies,

which range in size from stringers to bodies containing more than 50,000 tons and in grade from a few per cent to 50% chromic oxide. Analyses of the chromite alone, separated from the silicate gangue, show that it usually contains 54 to 59% chromic oxide and has a chrome-iron ratio of 3:1 or greater. The reserves are estimated to contain 150,000 tons of chromite. Three geologic maps and several detailed mine maps are included. R.A.H.

Clay and Shale Resources in Pennsylvania. HENRY LEIGHTON. *Penna. Topographic & Geol. Survey Bull.*, **M23,** 245 pp. (1941); *Chem. Abs.*, **35,** 7327 (1941).—L. gives detailed descriptions of deposits with physical tests, firing properties, etc., and more than 100 analyses.

Clays of West Tennessee. G. I. WHITLATCH. *Tenn. Dept. Conservation, Div. Geol., Bull.*, No. 49, 368 pp. (1940).—Clay is the fourth most valuable mineral resource of Tennessee, and the value of raw clay mined totals approximately $4,000,000 annually. West Tennessee is the most important clay-producing area of the State. W. gives a survey of clay resources and geological, ceramic, and other economic data on the clays of this area. Geologically, west Tennessee is in that part of the Gulf Coastal Plain called the "Mississippi embayment." The commercially valuable clays of west Tennessee include ball, wad, sagger, and other high-grade ceramic types, sedimentary kaolin, bleaching earths, loess, and residual clays. The high-grade ceramic clays are a basis of an extensive mining industry which centers at Paris and Whitloch in Henry County, at Gleason and Dresden in Weakley County, and at McKenzie in Carroll County. Four major companies and a number of small operators ship to all the principal ceramic centers of the U. S. The production of bleaching earth for the petroleum industry was initiated in Paris in 1937, and the development of newly discovered sedimentary kaolin deposits was begun in 1940 near Clarksburg, Carroll County. Heavy clay products manufactured in west Tennessee are largely limited to brick, but some firebrick, grate backs, farm draintile, and similar ware are produced. Memphis has three brick plants and Jackson, Hollow Rock, and Puryear have a single plant each; farm draintile is the principal product of the plant at Union City. Pottery, chiefly domestic stoneware, is made at small plants in Paris, Henry County, and in Toone, Hardeman County. The history of clay working in west Tennessee is discussed, the formation and properties of clays are described, and the field and laboratory procedures used by W. are given. The technology of clay mining and manufacturing as practiced in this area is described. All clay mining and manufacturing industries of the west Tennessee area are described in detail. Data are given on undeveloped clay deposits in 250 localities distributed through 19 counties of the west Tennessee area. All types of commercial clays available in the area are included, and each locality is individually described with reference to its commercial possibilities; ceramic and chemical data are cited on representative samples collected from various deposits. Particular stress has been placed on the oil-bleaching and lightweight product possibilities of clays of the Porter's Creek formation. Data on a number of clay deposits taken from the Tennessee Valley Authority files are included. The location of practically all deposits described is shown on a geological map of the area. H.T.

PATENTS

Chromium-ore processing. I. E. MUSKAT AND NORMAN HOWARD (Pittsburgh Plate Glass Co.). Can. 404,724, May 12, 1942 (Aug. 18, 1939; in U. S. Dec. 20, 1938). G.M.H.

Magnesium production. ROY C. KIRK (Dow Chemical Co.). Can. 403,799, March 31, 1942 (April 27, 1940). ROBERT SUCHY AND HELLMUTH SELIGER (Magnesium Elektron, Ltd.). Can. 404,278, April 21, 1942 (Dec. 28, 1938). G.M.H.

Purifying glass sands. F. X. TARTARON AND J. B. DUKE (Phosphate Recovery Corp.). U. S. 2,283,295, May 19, 1942 (July 11, 1941).—The process of separating the iron impurities from the silica of glass sands which consists of conditioning a thick aqueous pulp of such sands with cooperating agents consisting of a substantially insoluble and unsaponifiable oil, a fatty acid having a hydrocarbon radical of at least twelve carbon atoms, and an alkali and then diluting the conditioned pulp and subjecting it to froth flotation to float off the iron impurities from the silica, leaving the tailings as the purified glass sands.

Silica-removing process from minerals, etc. EDUARD ZINTL, WALTER KRINGS, AND WILHELM BRAÜNING (I. G. Farbenindustrie A.-G.). Can. 403,134, Feb. 24, 1942 (April 5, 1939). G.M.H.

Titanium bearing material chlorination. I. E. MUSKAT AND R. H. TAYLOR (Pittsburgh Plate Glass Co.). Can. 404,726, May 12, 1942 (Aug. 18, 1939; in U. S. June 30, 1939). G.M.H.

Titanium-ore processing. I. E. MUSKAT AND R. H. TAYLOR (Pittsburgh Plate Glass Co.). Can. 404,722 and 404,723, May 12, 1942 (Aug. 18, 1939). G.M.H.

Treatment of feldspathic and similar rock material. WILLIAM G. HUBLER (Ventures, Ltd.). Can. 399,873, Oct. 7, 1941 (Dec. 7, 1940).—A process for beneficiating nepheline-bearing or feldspathic ores containing magnetite and other impurities comprises comminuting the ore, agitating and conditioning with water and a fatty acid reagent to form an approximately 50% pulp (the reagent being used at the rate of 2 lb. per ton of ore), classifying to form a sand product and slimes, subjecting the sand to dry magnetic separation and the slimes to wet magnetic separation, thickening the nonmagnetic product of the wet magnetic step and adding a flocculating agent to the thickened material, and then filtering the material. In the case of ores containing impurities low in strongly magnetic particles, the process comprises comminuting, agitating with water and a fatty acid in the presence of finely divided strongly magnetic material, and then subjecting the material to magnetic separation. G.M.H.

Chemistry and Physics

Accelerated methods for the chemical analysis of ceramic materials and products. R. I. BORODITSKAYA. *Metody Issledovatel. Keram. Materialov,* **1939,** 236–49; *Khim. Referat. Zhur.*, **1940,** No. 2, p. 67; *Chem. Abs.*, **36,** 2101 (1942).—In aliquot parts, after fusion with soda, extraction, and acidification with H_2SO_4, determine Fe_2O_3 either according to the method of Zimmermann or colorimetrically with H_2O_2; determine Al_2O_3 by precipitating Al, Fe, and Ti with hydroxyquinoline, iodometric titration, and correction for the content of Fe_2O_3 and TiO_2. If it is required to determine SiO_2, CaO, MgO, SO_3, loss on ignition, and the content of base, then determine CaO, MgO, and SO_3 in aliquot parts after the separation of SiO_2. If Ca alone is to be determined, precipitate it with $(NH_4)_2C_2O_4$ in the presence of Fe, Al, and Ti after converting them into a complex by adding Seignette salt. After dissolving CaC_2O_4 in H_2SO_4, determine the CaO by titrating with $KMnO_4$. In determining CaO and MgO, it is necessary to separate Fe, Al, and Ti with NH_3 and to determine Ca in the form of CaC_2O_4. In the filtrate, determine MgO volumetrically by hydroxyquinoline. Determine SO_3 and the losses on heating by the usual methods. Decompose the sample with HF, evaporate, dilute with water and treat with $Ca(OH)_2$, filter, evaporate to dryness with $(NH_4)_2CO_3$, separate $CaCO_3$, and determine the total bases by titrating with 0.1 *N* HCl. If a separate determination of K_2O and Na_2O is required, then determine K in the solution after titration in the form of K chloroplatinate and Na in the form of Na zinc uranyl acetate.

Colorimetric determination of nickel with ammonia. Spectrophotometric study. J. P. MEHLIG. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 289–92 (1942).—A spectrophotometric study shows that the ammonia method for the colorimetric determination of nickel is satisfactory al-

though not highly sensitive. The region of highest sensitivity lies between 500 and 1500 p.p.m. of nickel. While the precision is not high, the average of several determinations agrees well with the results obtained by the gravimetric dimethylglyoxime method. The Ayres and Smith method need not be restricted to the determination of nickel in steel. For miscellaneous materials relatively low in iron, however, M. recommends that any precipitate produced by ammonium hydroxide in the absence of tartrate be filtered and the nickel determined in the filtrate without resorting to the dimethylglyoxime separation. The concentration of the ammonium hydroxide used for dilution must be carefully controlled because of the ability of the ammonia solution to absorb light. As the hue varies with the concentration, the same concentration must be used for the standards as for the unknown solutions. A 1.5 *M* solution is recommended. The color system follows Beer's law. The color is stable in diffuse light for at least 4 weeks and undoubtedly for a much longer time. The use of a series of permanent standards is therefore possible. The color reaction may be reproduced to a high degree of precision. A study of the effect of 60 common ions shows that only a few, especially cobaltous, cupric, cyanide, and dichromate, seriously interfere with the color and that many of the cations cause precipitation or turbidity, but in the course of the determination this latter group would be removed. Illustrated. F.G.H.

Detection of free alumina in silicate mixtures. L. A. Shmelev. *Metody Issledovatel. Keram. Materialov*, **1939**, 250–52; *Khim. Referat. Zhur.*, **1940**, No. 2, p. 67; *Chem. Abs.*, **36**, 2102 (1942).—Amorphous Al_2O_3 is colored by alizarin. Amorphous TiO_2 is also colored by alizarin but is distinguished from Al_2O_3 by destruction of the color with H_2O_2. Boil the sample with an alcohol solution of alizarin saturated with H_3BO_3, decant the liquid, and wash the precipitate with a saturated hot H_3BO_3 solution. The presence of free Al_2O_3 is indicated by the pink color of the precipitate. Alizarin solution containing no H_3BO_3 should be used for materials known to be free from oxides of alkali and alkaline-earth metals. The crystalline modifications of Al_2O_3 hydrates (diaspore and hydrargillite) cannot be detected by this reaction without a preliminary treatment.

Determination of strontium in the presence of calcium. Paul B. Stewart and Kenneth A. Kobe. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 298–99 (1942). F.G.H.

Direct determination of potassium in silicate rock. Hobart H. Willard, L. M. Liggett, and Harvey Diehl. *Ind. Eng. Chem., Anal. Ed.*, **14** [3] 234–35 (1942).—The metals in insoluble silicates are completely converted into perchlorates by evaporation of the silicate with hydrofluoric and perchloric acids, followed by a steam distillation at 140° to 150°C. to remove fluoride as hydrofluosilicic acid. After the small amount of silica is dehydrated, the solution is evaporated nearly to dryness, and the potassium is separated twice as perchlorate by extracting the soluble perchlorates with ethyl acetate. Illustrated. F.G.H.

Electrolytic determination of iron. William H. Armistead, Jr. *Ind. Eng. Chem., Anal. Ed.*, **14** [3] 207–209 (1942).—Iron can be quantitatively determined as metal by electrodeposition from a hot complex ferric phosphate-ammonium carbonate solution at a high current density without stirring. The method is accurate and reasonably fast. The highly sensitive ammonium sulfide test is available to prove the completeness of the deposition. The method may be applied to low manganese iron ores without removal of hydrochloric acid. Small amounts of nickel or molybdenum are quantitatively codeposited with large amounts of iron, and cobalt with at least twice as much iron. Tungsten must be absent. Large amounts of chloride, sulfate, and phosphate do not interfere. Nitrate and all strong oxidizing agents must be absent. F.G.H.

Orthonitrosophenol as a new reagent in colorimetric analysis. Determination of cobalt. Georg Cronheim. *Ind. Eng. Chem., Anal. Ed.*, **14** [5] 445–47 (1942).—Orthonitrosophenol as a new reagent in colorimetric analysis offers many possibilities for the estimation of small amounts of cobalt, palladium, iron, copper, mercury, and nickel. In the first application, *o*-nitrosophenol is used for the quantitative estimation of small amounts of cobalt. It is possible to estimate 5 μgm. of cobalt in 50 ml. with an error not exceeding 1%. The only interfering metals are trivalent iron and palladium. The interference of trivalent iron is eliminated by forming complex iron compounds which do not react with *o*-nitrosophenol. The interference of palladium can be eliminated by the use of suitable color filters. Illustrated. **Determination of divalent iron.** Georg Cronheim and William Wink. *Ibid.*, pp. 447–48.—A new method for the colorimetric estimation of divalent iron is based on the reaction of divalent iron with *o*-nitrosophenol, yielding a green inner-complex salt. The method is one of the most sensitive colorimetric determinations for this metal, since 0.5 μgm. in 50 ml. of solution can be estimated. Trivalent iron, cobalt, and palladium do not interfere. Copper, nickel, and mercury form red or reddish-violet compounds with the reagent. A comparison with a gravimetric determination of iron showed a very close agreement. Illustrated. F.G.H.

Potentiometric titrations. A review with bibliography. N. Howell Furman. *Ind. Eng. Chem., Anal. Ed.*, **14** [5] 367–82 (1942).—F. cites the chief aspects of published work in the field of potentiometric titrations and related simplified methods that depend upon changes in electrode potentials at the end points of titrations. The period included is that from the time of a preceding review (*ibid.*, **2**, 213 (1930)) to the end of 1941. The field is reviewed under the following general headings: (1) theory, (2) apparatus and technique, and (3) applications. Other recent reviews, monographs, and books in this field are listed. Illustrated. 630 references. See *Ceram. Abs.*, **11** [8] 472 (1932). F.G.H.

Reaction between calcined kaolin and lime in aqueous solution: I, Activity of the calcined kaolin. W. Strätling and H. zur Strassen. *Z. Anorg. & Allgem. Chem.*, **245**, 257–66 (1940); see *Ceram. Abs.*, **20** [7] 164 (1941). R.L.G.

Reaction in the solid state at higher temperatures: VII, Reaction between magnesium oxide and aluminum oxide in the solid state. Yasuo Tanaka. *Jour. Chem. Soc. Japan*, **62**, 477–79 (1941); *Chem. Abs.*, **35**, 7861 (1941).—Two series of experiments were performed: (1) The three mixtures $MgO : Al_2O_3 = 2 : 1$, $1 : 1$, and $1 : 2$ were heated at 1400° for 10 hr. (2) The two mixtures $MgO : Al_2O_3 = 1 : 1$ and $1 : 2$ were heated at 1000° for 3 hr. In both cases the free MgO in the reaction products was determined, and the X-ray diffraction pattern of the products was taken. The initial reaction product is always pure spinel irrespective of the ratio of the mixture. For Part **VI** see *Ceram. Abs.*, **20** [10] 249 (1941).

Reactions in solid state between calcium oxide and different preparations of titanium dioxide. J. A. Hedvall and K. Andersson. *Sci. Papers Inst. Phys. Chem. Research* [Tokyo], **38**, 210–17 (1941).—Reactions in the solid state between different modifications of TiO_2 (anatase and rutile) and CaO were studied. The anatase is more reactive than rutile, especially at temperatures at which anatase is transitioned into rutile. Impure rutile will react still better if reactive Fe_2O_3 is present as the impurity. The reaction product consists of $CaTiO_3$. Comparative experiments carried out in air, N_2, and H_2 show no differences in reaction yield. W.N.

Separation of copper, lead, and zinc with salicylaldoxime. L. P. Biefeld and W. B. Ligett. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 359–61 (1942).—Zinc salicylaldoximate begins to precipitate at pH 5.8, is completely precipitated in the range 7.1 to 8.1, and is again soluble above pH 9.7 if the pH is regulated with ammonia. Copper, lead, and zinc in the same solution may be separated with salicylaldoxime by precipitating the copper in weakly acidic solution, filtering it off, and then making the filtrate strongly ammoniacal to cause precipitation of the lead complex. The correct pH for precipitation of the copper complex is easily obtained by the use of modified methyl orange. The separation of lead from zinc in highly ammoniacal solution is improved by the addition of a large amount of ammo-

nium nitrate. In the presence of a high concentration of ammonium nitrate, a wide range of ammonia concentration may be used to prevent coprecipitation of zinc salicylaldoximate while still permitting complete precipitation of the lead. Zinc cannot be quantitatively precipitated as the salicylaldoximate in the strongly ammoniacal filtrate from the lead separation. Illustrated. F.G.H.

Separation of lithium from potassium and sodium by treatment of the chlorides with higher aliphatic alcohols. EARLE R. CALEY AND HERBERT D. AXILROD. *Ind. Eng. Chem., Anal. Ed.*, **14** [3] 242–44 (1942).—Experiments show that 2-ethylhexanol yields results equal to or better than those obtained by the use of isoamyl alcohol with the advantage that no solubility corrections are necessary and therefore no attention need be paid to the exact volume of solvent used in the extraction or for washing. Another advantage of 2-ethylhexanol over isoamyl alcohol for this separation is that the former need not be boiled in order to dehydrate the salts properly. As a consequence, the danger of loss from bumping is less, and quantities of disagreeable fumes are not evolved, which some chemists regard as a serious objection to the isoamyl alcohol method of Gooch. On the whole, 2-ethylhexanol appears to be the best solvent yet proposed for the separation of lithium from potassium and sodium by extraction of the mixed alkali chlorides. The ammonium stearate reaction for the detection or estimation of lithium may be applied with at least equal success in 2-ethylhexanol sclution. F.G.H.

Specific gravity of petroleum oils by the falling drop method. A. J. HOIBERG. *Ind. Eng. Chem., Anal. Ed.*, **14** [4] 323–25 (1942).—A method of densimetry which has shown many advantages in determinations with body fluids has been modified so that it may be used in the measurement of the specific gravity of petroleum oils. The operation is rapid and easy, as the procedure depends only on the measurement of the time of fall of a drop of oil in an alcohol-water solution. The specific gravity is then determined by direct conversion of the time of fall from a calibration curve for the solution. This method has been found accurate to within ±0.0010 unit of specific gravity. As only a few drops of the petroleum fraction are required, the determination may be made on the very small volumes of oils often obtained in analytical distillations or extractions. Illustrated. F.G.H.

System CaO–FeO–Al_2O_3–SiO_2: I, Results of quenching experiments on five joins. J. F. SCHAIRER. *Jour. Amer. Ceram. Soc.*, **25** [10] 241–74 (June, 1942).—60 references, 12 figures.

PATENTS

Manufacture of alkali metal silicate detergents. C. L. BAKER (Philadelphia Quartz Co.). U. S. 2,282,018, May 5, 1942 (Oct. 31, 1938).

Preparation of zirconium dioxide. TITANIUM ALLOY MFG. CO. Brit. 544,823, May 13, 1942 (Dec. 8, 1939).

Production of improved titanium pigments. G. R. SEIDEL (E. I. du Pont de Nemours & Co.). U. S. 2,284,772, June 2, 1942 (Aug. 30, 1940).—A process for the production of improved titanium pigments which comprises simultaneously and separately introducing into a reaction vessel a titanium pigment suspension, a water-soluble aluminum compound, and a precipitant for the aluminum compound, maintaining the concentration of titanium pigment in the mixture in the range of about 10 to 350 gm. pigment per liter, maintaining the hydrated aluminum oxide concentration in the mixture in the range of about 0.05 to 10% calculated as Al_2O_3 and based upon the weight of the pigment, maintaining a substantially constant pH in the mixture in the range of about 5 to 8.5, and withdrawing the pigment suspension from the reaction vessel.

Production of titanium compound. D. W. YOUNG (General Chemical Co.). U. S. 2,285,104, June 2, 1942 (March 29, 1940).—The method for making a titanium oxygen compound which comprises heating halide-acetate of titanium at a temperature not less than 800°C. for a time interval sufficient to form a titanium dioxide product the TiO_2 of which shows the X-ray pattern of rutile only, the product being further characterized by (1) taking, when formed in an unrestricted space, a petal-like physical structure of a surface area a great many times that of the initial material subjected to heating and (2) having a fragility such that light rubbing of coalescent particles reduces the product to an impalpable powder.

Pure magnesium hydroxide. OCEAN SALTS (Products), LTD., AND B. A. ADAMS. Brit. 535,852, April 24, 1941 (Sept. 20, 1939); *Chem. Abs.*, **36**, 1447 (1942).—Sea water or brine is treated with Na_2CO_3 or $MgCO_3$ and a small quantity of OH ions to remove Ca and bicarbonate ions, together with suspended or colloidal Fe, Al, and Si compounds, and the $Mg(OH)_2$ is then precipitated from the sea water, etc., with a hydroxide solution which is free from Ca, Fe, Al, and Si compounds.

Titanium dioxide preparation. I. E. MUSKAT (Pittsburgh Plate Glass Co.). Can. 404,721, May 12, 1942 (Aug. 18, 1939). I. E. MUSKAT AND ALPHONSE PECHUKAS (Pittsburgh Plate Glass Co.). Can. 404,725, May 12, 1942 (Aug. 18, 1939; in U. S. May 4, 1939). G.M.H.

General

All-inclusive coverage of occupational diseases under the New York Workmen's Compensation Law. ANON. *Internat. Labor Rev.*, **45**, 157–65 (1942).—After a short survey of plans for occupational disease compensation, the New York system is described, under which 27 occupational diseases were originally compensable and to which, in 1935, a paragraph covering "any and all occupational diseases," was added. In 1936, silicosis and other dust diseases were included. In 1938, the definition was stated to cover "conditions which attach to an occupation a hazard which distinguishes it from the usual run of occupations and is in excess of the hazard attending employment in general." Conditions compensated under this definition include hernia, facial paralysis, Dupuytren's contraction, bronchitis, bronchiectasis, pneumonia, and tuberculosis and infectious diseases, especially among nurses and attendants in hospitals. The number of cases of compensated diseases increased from 694 in 1935 to 1775 in 1940, but the number is still less than 3% of the compensation cases from all causes. A large proportion of the cost of occupational diseases is caused by the high compensation cost in deaths and permanent disability from silicosis and other dust diseases. F.S.M.

Lulu Scott Backus. ANON. *Bull. Amer. Ceram. Soc.*, **21** [5] 61–64 (1942).—4 photos.

Case of poisoning by hydrogen selenide. H. W. SENF. *Deut. Med. Wochschr.*, **67**, 1094–96 (1941).—S. gives a survey of the literature and reports a case of poisoning by pure hydrogen selenide in a chemist working continuously in its production. Signs and symptoms included flow of tears, coryza, hoarseness, dyspnea, purple rash on the cheeks, edema, thrombophlebitis in the calf, and finally a heart lesion. Selenium could not be found in the urine or sputum. F.S.M.

Commercial talc. Animal and mineralogic studies. R. Z. SCHULZ AND C. R. WILLIAMS. *Jour. Ind. Hyg. & Toxicol.*, **24**, 75–79 (April, 1942).—Petrographic analysis showed that, in certain talcs, carbonate and serpentine decreased as the experiment progressed. Such talcs are to be preferred from the health aspect, inasmuch as a smaller amount of material is more or less permanently stored. The greatest amount of fibrous tissue was developed in the presence of the two talcs which contained the least carbonate. Talcs of this type should be avoided wherever possible, but when these are essential, methods of controlling the dust should be employed. F.S.M.

Employee being allergic to cleaning compound does not prevent dermatitis award. *Occupational Hazards*, **4**, 26 (April, 1942).—In the case of the Kroger Grocery & Baking Co. vs. Industrial Com. (Wis.) 1 N.W. 2d 802 (Jan., 1942), the employee developed a dermatitis from the use of a certain cleaning compound. The evidence showed that

the claimant was allergic to the substance contained in the cleaning compound and consequently was more susceptible to the development of a dermatitis from it than persons not having such susceptibility. This did not prevent an award. Under the Workmen's Compensation Act, providing compensation for injuries caused by accident or disease arising out of employment, any disease that is caused by an employee's work becomes compensable notwithstanding an allergic tendency of the employee to the conditions that made the disease possible. F.S.M.

Humidity as a health factor in air conditioning. F. W. HUTCHINSON. *Heating & Ventilating*, **39**, 22–24 (April, 1942).—The present state of knowledge concerning humidity and health is very unsatisfactory. There seems to be little justification for the advocacy of humidity control as a health measure. On the other hand, the possibility of unusual humidities being decidedly unhealthful is sufficiently well founded to warrant the greatest hesitancy on the part of the engineer in using air-conditioning methods which result in unusually high or low humidities even though they may be within the so-called comfort zone. Within the comfort zone, the most important influence seems to be the inverse relationship which exists between that intangible quality called "freshness" and the humidity of indoor air. F.S.M.

Influence of atmospheric temperature and humidity upon the dryness of the oral mucosa. C. E. A. WINSLOW, L. P. HERRINGTON, AND J. H. NELBACH. *Amer. Jour. Hyg.*, **35**, 27–39 (Jan., 1942).—The condition of the oral mucosa as affected by surface moisture was studied by weighing the quantity of moisture absorbed by small disks of dried blotting paper applied to the back of the throat for a period of 5 sec. Observations before and during exposure of subjects to various temperatures and humidities showed that the drying effect of the respired air is a function of its vapor pressure. With pressures above 0.4 in. of mercury the mucosa was relatively moist, but with vapor pressures below 0.4 in. there was a marked drying of the mucosa. No evidence is presented to show that such drying is harmful, but it is pointed out that if the effect is to be controlled, a relative humidity of over 50% is necessary with ordinary room temperatures of about 70°F. F.S.M.

Management and labor. Example of cooperation in works. *Electrician*, **128** [3330] 273–75 (1942).—For many years, the principle of group cooperation for improving the operation efficiency of manufacturing organizations has been followed by the British Thomson-Houston Co., Ltd., all the managerial plans, policies, and programs aiming at improving the service rendered by the production flow as expressed in a better article produced at a lower cost and in a shorter time, coupled with a steady elevation of human and cultural values throughout the operating group. The main plant of the company is somewhat exceptional in the range and complexity of its production problems because, normally, this organization embraces a wide range of separate and in many respects diverse businesses within the electrical industry. The group established with respect to any particular line embraces three key persons: (1) the engineer in charge of the design section, (2) the manager in charge of the sales section, and (3) the superintendent in charge of the productive unit. These three members meet every month to review the progress being made in all phases, special attention being given to greater production, improved quality, and lower cost. This inner group functions as a kind of governing board responsible for the successful conduct of the business, each member being responsible to the appropriate director of the company. To further the spirit of cooperation between all sections of the manufacturing department, regular group meetings are held as follows: Planning Committee, Waste Elimination Committee, Accident Prevention Committee, and Suggestions Committee meetings and a Manager's monthly meeting (a monthly meeting of superintendents and heads of departments presided over by the manager). At this meeting all problems which bear on production are reviewed. Regular departmental meetings are also held at which the superintendent or head of the department presides. The key members of the department are thus brought together by the leader who outlines the broad picture given at the superintendents' monthly meeting and, at the same time, discusses in considerable detail the problems which face the department. H.K.R.

Nonmetallic industrial material for chemical apparatus. V. E. VOLODIN AND I. YA. KLINOV. *Khim. Mashinostroenie*, **9** [4–5] 31–35 (1940); abstracted in *Chem. Zentr.*, **1941, I,** 1450.—The authors discuss the different fields of application of refractory materials, quartz glass and types of glass that are mechanically and chemically durable, acidproof concrete, cements with water glass, acid cements, bituminous mastics, rubber coatings, plastics, enamels, and wood in chemical apparatus. M.V.C.

Nontuberculous conditions and complications of tuberculosis. C. J. KOERTH ET AL. *Diseases of the Chest*, **8**, 40–49 (Feb., 1942).—Most of the large number of nontuberculous patients who are mistakenly admitted to tuberculosis institutions could have had proper diagnoses if sufficient time had been given to the history and examination. Silicosis is the disease most frequently mistaken for tuberculosis. History of exposure, symptoms, and physical, roentgen, and laboratory examinations must be obtained to make a diagnosis. A brief description, including reproductions of roentgenograms, is given of 11 cases of several diseases admitted to the Woodmen of the World Hospital with an erroneous diagnosis of simple pulmonary tuberculosis. Five of the cases exhibit combinations of silicosis, silicomoniliasis, and silicotuberculosis. Salient points in differentiating such cases from ordinary pulmonary tuberculosis are well brought out both in the discussion and in the roentgenograms. The chief indications of silicosis include a history of long silica exposure, negative sputum for tubercle bacilli, pinpoint nodular infiltration uniformly throughout both lungs (in early silicosis), and physical findings less marked than such symptoms as shortness of breath and weakness. The other six cases, treated briefly, include pulmonary carcinoma, sarcoma, lymphogranuloma and abscess, aortic aneurysm, and thyrotoxicosis. In addition, two frank pulmonary tuberculosis cases are presented briefly to illustrate such complications as pleuritic effusion and spontaneous pneumothorax. F.S.M.

Outline of industrial exhaust ventilation. F. F. KRAVATH. *Heating & Ventilating*, **39**, 36–58 (April, 1942).—K. presents a comprehensive guide (in outline form) to be followed in the design of an industrial exhaust ventilation system of any type, together with an explanation of each heading and subheading. The guide is profusely illustrated and the proper combination and sizing of the elements comprising a system are discussed. This Reference Section is divided into two parts: the first is devoted to the technical phases of the subject, and the second is made up of brief illustrated descriptions of a number of actual installations of various types of exhaust systems covering a fairly wide scope of industries and equipment combinations. A limited number of reprints of this 24-page section are available at 25¢ each, postpaid, from Heating and Ventilating, 148 Lafayette Street, New York, N. Y. F.S.M.

Packages don war garb. WATSON DAVIS. *Science News Letter*, **41** [16] 246–50 (1942).—Wood, china, and clay products are coming into vogue again as containers for many things on grocery and drugstore shelves. Glass jars, bottles, glasses, and cups that must take over the civilian canning job will be simplified and shorn of unnecessary material and decoration. G.A.K.

Plant hygiene studies. AMERICAN MEDICAL ASSN. COUNCIL ON INDUSTRIAL HEALTH. *Jour. Amer. Med. Assn.*, **118**, 818–19 (March 7, 1942).—The primary function of the industrial physician is the location, identification, and control of unhealthful occupational exposures. Plant hygiene studies have proved to be a reliable and inexpensive method of obtaining dependable data on which may be based a program of adequate control. The technique of making such a survey is outlined for the physician. F.S.M.

Problem of harmless cleansing of skin. W. BURCKHARDT. *Schweiz. Med. Wochschr.*, **71**, 1097 (Sept. 20, 1941); abstracted in *Jour. Amer. Med. Assn.*, **118**, 849 (March 7, 1942).—B. discusses the role of alkaline substances in the pathogenesis of eczemas. The results of experimental patch tests are reported, and observations on patients with eczema caused by soaps show that the offensive substance is not the perfume but always the alkali. A search was made for neutral skin cleansers to replace alkaline soaps. The properties of a skin cleanser whose active constituents are fat alcohol sulfonates are described. It is effective and harmless. It is helpful in preventing eczema, particularly in persons whose skin is hypersensitive to alkali and whose occupation involves frequent cleansing of the hands. F.S.M.

Promoting industrial safety by exhibitions. A. BRANDT. *Sprechsaal*, **73** [49] 448–49 (1940).—The manager of a plant has the responsibility but often lacks knowledge as to the latest safety devices. Foremen are often too overburdened with other work to give sufficient study to the question of safety. It is difficult, especially under the system of piecework, to get the workmen not to sacrifice safety in trying to attain the greatest possible production. Success could be attained only when the effects of a good safety system were presented as forcibly as possible to the workmen. A section of the German Hygiene Museum was rearranged for an exhibition. The most severe of all occupational diseases, silicosis, is illustrated by large models, X-ray pictures, and dioramas. The development of occupational eczema, the most frequent industrial disease, is shown with the aid of huge models. The effect of poison is shown in an especially comprehensive exhibit; the observer sees how the poison acts on the human body and what organs are affected. On one screen are shown the occupations where there is danger of poisoning, and simultaneously on another screen the symptoms of the disease caused by the poison are shown. In another hall, all the technical means for protecting the workmen, from the means of purifying the air to a good posture in working, are exhibited. Most of the problems of workmens' protection are brought together in a large model of a manufacturing plant in which all the remedies which have been applied in Saxon plants are assembled. Good and bad arrangements of shops, waiting rooms, and locker rooms are shown, and examples of good and bad illumination are given. A portable exhibition, covering 450 m.², was assembled on a truck and taken from shop to shop. So far, 158 plants have been visited in Saxony. Four weeks were spent at the I. G. Farbenindustrie A.-G. Since 1938, 187,000 people have viewed the exhibit, and in no other way could such a strong impression in regard to safety have been made on so many workmen. Without the interest and cooperation of the workmen, all attempts at improving measures for their safety are futile. W.H.H.

Protection of the working woman in the Third Reich. ZWEILING. *Sprechsaal*, **73** [48] 437–40 (1940).—Women are especially suited for tasks requiring great dexterity but not great strength. Of the working women, 69% are in industry. Women are not permitted to work in places where their health might be injured by poisonous gases, dust, great heat, or vibrations; they cannot regularly lift heavy weights. In the ceramic industry, they are permitted to cast only small objects weighing not over 15 kgm. Work should be so arranged that the men do the heavy work and the lighter work falls to the women. More specifically, women are excluded from the following types of work in the stone and clay industries: (1) work in grinding, (2) harbor and stoneworks, (3) work in mixing raw materials for glassmaking, (4) work in all types of furnaces, (5) work in grinding or breaking glassware, (6) sandblasting, (7) working with hydrofluoric acid of over 30% concentration, (8) painting with glass colors containing lead when they cannot be applied with a brush or rubber stamp. In the heavy clay products and fine ceramics industry, women are forbidden to place the filled saggers in the furnace or to remove the ware after firing. They must not carry the filled saggers or boxes of fired ware weighing over 15 kgm., and may not be employed in fritting. The temperature in shops must not be allowed to fall below 61°F. If a lower temperature is required for technical reasons, the employees must have a room heated to at least 64°F. at their disposal, with facilities for heating water. Hours of labor have been increased during the war, and in extreme cases 10 hr. daily or 56 hr. weekly are permitted. If work periods of 6 to 9 hr. without a stop are required, there must be a half-hour rest and at least a 1-hr. rest after longer periods of work. Women are paid the same as men for piecework, but when paid by time, it must be considered that cranes have to be installed to lighten the work of women; for this reason they are paid 80% as much as men. When women work over 9 hr. and must be present at their place of work 10 hr. daily or if they work nights, they are allowed increased rations. An increase is also allowed to a worker who lives so far away as to necessitate more than 11 hr. daily absence from home. W.H.H.

Quality control in manufacture. H. RISSIK. *Electrician*, **128** [3330] 276–80 (1942).—R. discusses the use of statistical methods of control by means of a special type of control chart which serves to (1) judge the homogeneity of the product (stability test), and (2) draw attention to sources of potential trouble so that remedial action can be taken (purposive control). H.K.R.

Rate of solution of particles of quartz and certain silicates. P. H. KITTO AND H. S. PATTERSON. *Jour. Ind. Hyg. & Toxicol.*, **24**, 59–73 (April, 1942).—Experiments on the solubility at 36.9°C. of quartz and silica suspensions of particle size comparable to the dust in mine air are described, in which conditions of preparation of the samples were carefully controlled and interfering factors were reduced to a minimum. The effects of varying pH, particle size, and methods of preparation on the rate of solution of the particles are given. The initial rate depends on many factors, but the final rate may be proportional or nearly proportional to the radius. After some weeks, the solution of the particles reaches a very slow steady rate which is probably the true solubility of the undisturbed surfaces. Experiments on the depression of the rate of solution and the removal of silica already in solution are mentioned. The theory of the solution of dusts and the results obtained are discussed. The initial high rate of solution is due mainly to the effect of the Beilby layer and the edge, and as these are dissolved the rate decreases rapidly. The intrinsic solubility of the finest particles is probably higher, even when this disturbed outer surface has been removed. F.S.M.

Removal of carbon dioxide from rebreathing apparatus. J. ADRIANI. *Jour. Aviation Med.*, **12**, 304–309 (Dec., 1941).—Rebreathing apparatus consists essentially of a closed system equipped with a method for efficiently removing carbon dioxide. Two types are described, with special emphasis on the canister and the properties of its contents. Comparative data are presented and considered from physiological, chemical, and physical viewpoints. F.S.M.

Shattering of particles by the impinger. L. SILVERMAN AND W. FRANKLIN. *Jour. Ind. Hyg. & Toxicol.*, **24**, 80–82 (April, 1942).—A careful analysis of existing data on the shattering of impinger particles by the Greenburg-Smith technique shows no conclusive evidence of shattering. Several writers give results which indicate shattering, but these may be in error due to inadequate precautions against selective sampling. Other sources of error in their observations include the failure to size all the particles and the use of an impingement velocity higher than that specified. Experimental data obtained showed no shattering of discrete small glass spherical particles and no significant change in the mean particle size of ground flint at the normal sampling rate. Aggregates were observed in both original and impinged samples. The number of aggregates did not appear to be significant. F.S.M.

Silicon and silicon halogens. ANON. *Jour. Amer. Med. Assn.*, **118**, 857 (March 7, 1942).—In reply to a query concerning industrial poisoning by "silicon gas," several possible forms of exposure are discussed. Air-borne sus-

pensions of the element silicon might be construed as gaseous in the fumes liberated on electric-furnace treatment. The fine particles of such fumes collect as long cobweb-like streamers in flues, rafters, etc. It has been shown by animal experimentation that this form is inert and incapable of producing tissue changes except phagocytosis. The same is true of coarser particles 1 to 3 microns in diameter. On the other hand, some of the gaseous compounds of silicon are injurious. Silicon tetrafluoride is a colorless, irritating gas. The tetrachloride has a suffocating odor and is used in the preparation of smoke screens. Several other halogen compounds are known. Of the organic silicates that might be inhaled as vapors, ethyl silicate has been found to be highly toxic on injection into animals. F.S.M.

Ultraviolet burns of the eye. ANON. *Jour. Amer. Med. Assn.*, **118,** 1264 (April 4, 1942).—An increase in ultraviolet burns of the eye is accompanying expansion of the heavy industries. In the beginning of an attack of photophthalmia, ice applications are of some value. Cocaine is contraindicated, but one of the more recent corneal anesthetics affords relief. An antiseptic to prevent infection of the eroded area is valuable. After 24 hr., heat hastens epithelial regeneration. There are no known therapeutic agents of curative value, but the condition is self-limited, provided there is no intercurrent infection of the corneal surface. F.S.M.

Zinc poisoning. T. E. P. GOCHER. *Northwest Medicine*, **40,** 476 (Dec., 1941); abstracted in *Jour. Amer. Med. Assn.*, **118,** 1012 (March 21, 1942).—The complaints that follow exposure to the fumes and dust of zinc oxide, chromate, sulfate, and chloride are enumerated. They are dermatitis of the trunk and of the upper parts of the thighs, conjunctivitis, chills, gastrointestinal upsets, chronic anemia after about six months of exposure, boils, and eczema. No permanent disabilities were observed, but a number of men retained a distinct susceptibility and allergy to zinc salts. F.S.M.

BOOK AND SEPARATE PUBLICATIONS

Directory of Commercial Testing and College Research Laboratories. ANON. *Nat. Bur. Standards Misc. Pub.*, M171, 63 pp. (Feb., 1942). Supt. of Documents, Govt. Printing Office, Washington, D. C. Price 15¢.—This directory supersedes *ibid.*, M125. R.A.H.

Occupational Diseases and the Law. J. D. DORSETT. Transcript of a lecture delivered as part of the course on Industrial Hygiene and Occupational Diseases at the Center for Safety Education, New York University, New York, N. Y., Jan., 1942. 21 pp.—D. discusses the legal rights and obligations of the employee and the employer after the former has suffered physical injury as the result of hazards incident to his employment. The history of occupational disease compensation in the U. S. is traced briefly with accounts of the important cases that led to changes in the laws. The definition of occupational disease is discussed. A list of states is given in which diseases are (1) scheduled or specifically described, (2) defined in general terms, or (3) undefined. The problem of dating of compensation is discussed, and varied interpretations in different states are given. Especially in the case of dust diseases, the problem of accrued liability has arisen, and the experience in New York State with the unworkable law of 1935, leading to the enactment of Article 4-a of the present law, covering accrued liability by graduated benefits, is described. Similar laws have been enacted in several states, and a modified plan has been in force in Pennsylvania; it was adjusted in 1939 so that the State pays a part of the compensation directly when the disability accrued from a time before the law was passed; the law applies to other diseases in addition to silicosis. The procedures of Ohio and Washington, calling for divided compensation, have led to difficulties which have not as yet been altogether adjusted. The North Carolina plan, by which full compensation may be waived by employees who are not fully disabled, is discussed. The definition of "accident" is also not a simple matter, and state laws vary in their ruling on the meaning of accidental injury. The trend, at least recently, has been toward the enactment of well-considered laws; not only good laws, however, but also good administration is essential. D. stresses the prevention of accidents and occupational diseases as a solution of the problems and recounts the part of legislation, government bureaus, the insurance companies, and other organizations in furthering prevention. F.S.M.

Standard Body Parts Adjustment Guide: Traumatic Cases, Occupational Diseases, Disability Evaluations, Medical Fees, Statutory Digests. Insurance Statistical Service of North America, Chicago, Ill. Price $15, including ten years' revision service.—A useful loose-leaf manual provides a very convenient presentation of the legal and medical aspects of evaluation of disability and injury and disease compensation. The medical material, particularly the anatomical charts, is designed to be used by lay persons, both in management and insurance, and is very clear and concise. The section on medical fees should be of value to all having compensation problems. There is a handy arrangement of data on occupational diseases, listing the nature of the hazard and its symptoms, and a summary of the statutory regulations governing compensation in the States and Federal divisions. F.S.M.

PATENT

Ceramic bodies and method of making. BATTELLE MEMORIAL INSTITUTE. Brit. 544,913, May 13, 1942 (Dec. 24, 1938).

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JOURNAL REFERENCE: The journal name appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).

Vol. 21 **August 15, 1942** **No. 8**

Abrasives

Machine tool construction in carbide tool grinder. ANON. *Can. Machinery*, **53** [4] 108 (1942).—A new carbide tool grinder which uses 6-in. carbide or diamond wheels has been placed on the market by the Hammond Machinery Builders. E.D.M.

Portman rotary surface grinder. ANON. *Machinery* [N. Y.], **48** [10] 173 (1942).—A new rotary-type surface grinder capable of grinding concave, convex, and flat surfaces is described. R.H.B.

Radiac abrasive cut-off machine. ANON. *Machinery* [N. Y.], **48** [10] 174 (1942).—An abrasive wet cut-off machine with a patented hand-operated vise is shown. See *Ceram. Abs.*, **20** [6] 135 (1941). R.H.B.

Sav-Way internal grinder. ANON. *Machinery* [N. Y.], **48** [10] 176 (1942).—This grinder is capable of grinding holes up to 9 in. deep and 1/4 to 18 in. in diameter with straight or tapered sides. R.H.B.

Tool grinding: Introduction. A. J. SCHROEDER. *Metallurgia*, **26** [151] 13 (May, 1942).—S. emphasizes the importance of keeping tools in the best condition to meet modern precision requirements. Tools should be ground only by men specially trained and having wide experience in the use of modern equipment. E.P.

BOOK

Surface Finish: Report of the Research Dept., Institution of Production Engineers. G. SCHLESINGER. Inst. Production Engrs., London, 1942. 231 pp. Reviewed in *Bull. Brit. Non-Ferrous Metals Research Assn.*, No. 155, p. 146 (May, 1942).—S. presents the results of investigations on the surface finish of numerous products (mainly ferrous, with a few nonferrous) by various instruments (Profilometer, Surface meter, Profile microscope, Comparascope, comparison microscope, and Vickers microscope). The following subjects are dealt with: principal factors involved, influence of the scratching action of the stylus of tracer instruments, classification of surfaces without measurement, quantitative photomicrography, dimensions and surface roughness of gauges, instruments used, and investigation of surface roughness in the U. S. [NOTE: An omission from among the methods of evaluating surface finish is the reflectivity method developed by L. Kenworthy and J. M. Waldram, working for the British Non-Ferrous Metals Research Assn.]. See *Ceram. Abs.*, **19** [10] 227 (1940).

PATENTS

Abrading device. G. W. ROSS. U. S. 2,285,874, June 9, 1942 (May 22, 1941).

Abrading machine. H. N. BARNES. Brit. 545,257, May 28, 1942 (Nov. 12, 1940). L. K. GODDU (American Optical Co.). U. S. 2,286,361, June 16, 1942 (March 27, 1939).

Automatic honing mechanism and control means therefor. C. W. FLOSS. U. S. 22,125, June 23, 1942 (Aug. 19, 1940); reissue of U. S. 2,164,811, July 4, 1939 (Feb. 15, 1938).

Coating mechanism for wheels. N. P. DI CESARE. U. S. 2,285,695, June 9, 1942 (April 11, 1941).

Cutting and grinding tools. WALTHER DAWIHL (General Electric Co.). U. S. 2,285,909, June 9, 1942 (June 8, 1940).—A tool consisting of diamonds and a metallic binder characterized by the fact that the metallic binder consists of a chemical compound of cobalt, tungsten, and carbon in accordance with the formula Co_3W_3C.

Devices for sharpening or honing safety-razor blades. J. R. CLAYTON. Brit. 545,095, May 20, 1942 (Feb. 26, 1941).

Granular-coated article and its manufacture. H. P. KIRCHNER (Carborundum Co.). U. S. 2,286,208, June 16, 1942 (Dec. 3, 1940).

Grinding machine. A. W. MALL. U. S. 2,286,293, June 16, 1942 (March 4, 1940).

Grinding-wheel dresser. J. H. NELSON (Dumore Co.). U. S. 2,287,701, June 23, 1942 (March 28, 1940).

Grinding-wheel mounting and control. M. H. ARMS AND J. B. JOHNSON (Bryant Chucking Grinder Co.). U. S. 2,288,508, June 30, 1942 (April 23, 1940).

Honing machine. H. J. CALDWELL (Barnes Drill Co.). U. S. 2,287,085, June 23, 1942 (Sept. 29, 1939).

Lapping machine truing apparatus. H. S. INDGE (Norton Co.). U. S. 2,285,717, June 9, 1942 (March 16, 1940).

Machine for grinding facets in lens edges. A. L. ANDERSON (Cosmet Corp.). U. S. 2,286,886, June 16, 1942 (Feb. 29, 1940).

Means for trimming shaped grinding wheels. A. C. WICKMAN. U. S. 2,286,046, June 9, 1942 (Oct. 15, 1940).

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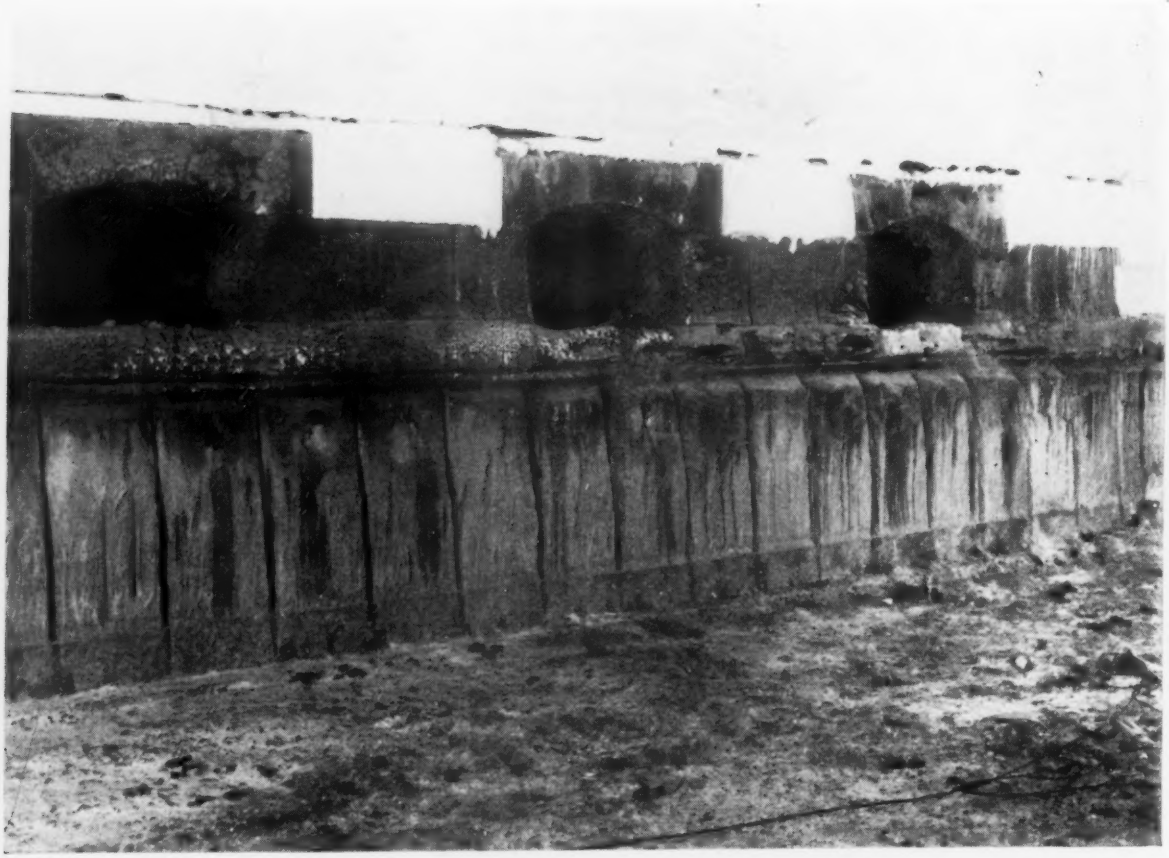

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Volume 21 July 15, 1942 Number 7

Dr. Cullen Warner Parmelee

WE SALUTE DOCTOR CULLEN WARNER PARMELEE FOR FOUR DECADES OF SUCCESSFUL SERVICE IN CERAMICS

Cullen Warner Parmelee, professor and head of the Department of Ceramic Engineering at the University of Illinois, Urbana, Illinois, was born in Brooklyn, New York, on June 27, 1874. His father, Lauren Sylvester Everett Parmelee, the son of a Baptist minister, was a teller in a bank in New York City until illness compelled him to leave this position. After his recovery, he became a bookkeeper and was known for his expertness in this work. Cullen's mother, Mary Alida Payne, was, like his father, of early Connecticut colonial stock.

Education

Cullen received his primary education in the grade schools of Manasquan, Asbury Park, and Ocean Grove, New Jersey, and was graduated as valedictorian from the high school of Asbury Park, New Jersey. He entered Rutgers University, where he majored in chemistry, the subject in which he received honors when he was graduated with the degree of Bachelor of Science in 1896. In recognition of his scholastic attainments, he was elected to Phi Beta Kappa in his senior year. During his undergraduate days, he was a member of the college track team and editor of the college weekly. He had won a scholarship in a competitive examination before entering college, and he supplemented his finances by doing clerical jobs and serving as a reporter of college news for a local newspaper. He received the degrees of Master of Science in 1926 and of Doctor of Science in 1936 from the same institution; both degrees were awarded in recognition of his professional and scientific attainments.

Employment

Following his graduation from Rutgers University, Cullen was employed as chemist by the New York and Boston Dyewood Company, Brooklyn, New York, from 1896 to 1901, when he returned to Rutgers as an instructor in chemistry.

Rutgers Ceramic Department

In 1902, Cullen organized the Department of Clay Working and Ceramics at Rutgers and served as director of that Department for fourteen years. He was appointed associate professor of applied chemistry in 1905 and professor of ceramics in 1908.

The establishment of the Department of Ceramics at Rutgers University was achieved through the efforts of a large group of clay miners and manufacturers of clay products, which was led by Charles A. Bloomfield of Metuchen, William S. Myers of New Brunswick, and Edward C. Stover of Trenton, all of New Jersey. No formal organization of the group was attempted; instead, the leaders and friends of the movement compaigned among the legislators by personal solicitation and correspondence. Mr. Bloomfield had a wide acquaintance among the state clay workers, and Professor Myers had valuable contacts with important politicians. He also conducted lively propaganda among graduates and friends of Rutgers University.

The bill providing for the establishment of the Department was closely patterned after that which created a similar department at Ohio State University, Columbus, Ohio. It was introduced in the legislature in 1901, but failed to pass by one vote. Reintroduced in 1902, it was passed with only one dissenting vote.

Twelve thousand dollars were initially appropriated for building, equipment, supplies, and salary. Twenty-five hundred dollars were provided for maintenance for the year 1903; this amount was annually granted for some years before more liberal support could be secured.*

* For a description of the initial ceramic plant and curricula, see *Trans. Amer. Ceram. Soc.*, **5**, 122 (1903).

New Jersey Clay Workers' Association

In June, 1914, with the assistance of Charles A. Bloomfield, Edward C. Stover, John A. Maddox, and others, Cullen organized the New Jersey Clay Workers' Association and was its first secretary-treasurer. He continued as such until he left New Jersey.

At University of Illinois

In 1916, Cullen accepted the position of professor of ceramic engineering at the University of Illinois. He served as acting head of the Department of Ceramic Engineering during 1922–1923 and was made head of the Department in 1923, continuing in that capacity for the past nineteen years. He also has been consultant ceramist for the Illinois Geological Survey for a number of years.

Cullen organized and directed the Conferences on Glass Problems, seven of which have been held at the University of Illinois since June, 1934. He also proposed and assisted in the organization of the Illinois Ceramic Institute.

Author

Professor Parmelee is the author of three books and of various bulletins of the Engineering Experiment Station of the University of Illinois and of the Illinois State Geological Survey. He has made numerous contributions to the publications of The American Ceramic Society and of other technical and scientific societies in the United States and abroad. Twenty-eight of his more than one hundred publications have been on the properties and tests of various ceramic materials, twenty-two in the field of glass technology, twelve on whiteware, ten on glazes, and some on other clay products, refractories, enamels, and fuels. The variety of subjects included in his contributions indicates the broad scope of his interest in research and investigation in the field of ceramic materials and products.

Service in The American Ceramic Society

Cullen became an Associate Member of The American Ceramic Society in 1903 and was elected to active membership in 1906. He served as Trustee from 1908 to 1911, was Vice-President in 1912–1913, and President of The Society in 1914–1915. He has been active as a member and as chairman of a great many committees of The Society and of its Divisions. He was chairman of the committee which considered and recommended the plan of publishing the monthly *Journal of The American Ceramic Society*. He is one of the Charter Members of the Fellows of The American Ceramic Society and has held the offices of Associate Dean (1933–1934) and Dean (1934–1935) of the Fellows. He has directed much of the work of the committees on Ceramic Education and Surveys of Ceramic Engineering Curricula and was president of the Ceramic Educational Council in 1940–1941.

At the Forty-Fourth Annual Meeting of The American Ceramic Society held in Cincinnati, Ohio, in April, 1942, Dr. Parmelee was presented a Life Membership in The Society by the unanimous vote of the Board of Trustees. This is an honor which heretofore has been conferred only on Charter Members of The Society.

Work in Other Societies

Dr. Parmelee is also a member of the British Ceramic Society, Der Deutsche Keramische Gesellschaft (in which he was elected to Honorary Membership in 1937), the

Institute of Ceramic Engineers, the Ceramic Educational Council, the American Refractories Institute, the Chicago Section of The American Ceramic Society, the Illinois Clay Manufacturers' Association, and the Illinois Ceramic Institute.

He holds membership also in the National Research Council (Division of Engineering and Industrial Research), the Society for the Promotion of Engineering Education, Sigma Xi, Alpha Chi Sigma, Keramos, Phi Beta Kappa, and Phi Kappa Phi. He was for many years a member of the American Chemical Society and the American Society for Testing Materials.

He is also a member of Beta Theta Pi fraternity and of Rotary.

For many years, Cullen was active in the National Brick Manufacturers' Association and was chairman of the Research Committee of the National Brick Manufacturers' Research Foundation. He served as district chief of the Industrial Furnace Section of the United States Fuel Administration in 1918 and was a member of the Joint Committee of the American Foundrymen's Association and the Division of Engineering of the National Research Council on Molding Sand Research. For a number of years, he was secretary-treasurer of the Illinois Clay Manufacturers' Association. He is president of the Illinois chapter of Sigma Xi for 1942.

During 1930–1931, Cullent spent a year of sabbatical leave in Europe, where he was engaged in the study of technical and scientific research and developments in England, Germany, Czechoslovakia, France, and Italy.

His Family

Cullen married, on October 3, 1901, his former schoolmate, Julia Russell Davis of Asbury Park, New Jersey, a trained nurse. Mrs. Parmelee was a daughter of Louise Schaffer and Theodore Russell Davis. Mr. Davis was an artist and war correspondent for *Harper's Weekly* and also reported and illustrated the building of the Union Pacific Railroad for the same journal. During the Hayes administration, he designed the dinner service made by Haviland and Company for use at the White House.

Three children, two sons and a daughter, are graduates of the University of Illinois. Another daughter, Mary Payne, died in childhood as a result of an accident. The eldest son, Cullen Everett, is engaged as an engineer in air-conditioning work in New York City. Eleanor Paulding Parmelee is a physiotherapist in Detroit, Michigan, and Theodore Davis Parmelee is an artist, formerly with the Disney Studios and now working independently in California.

A Forty-Year Record

The record of forty years as a teacher, as an investigator, and as an organizer of educational and research activities in the field of ceramic engineering places Doctor Cullen Warner Parmelee in a position of leadership that is well recognized and for which he has received recognition here and abroad.

Dr. Parmelee will retire as head of the Department of Ceramic Engineering in September, 1942. His achievements, however, will not cease. He will continue to equal, if not surpass, the work he has done in the past.

(1942)

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(3) (With T. N. McVay) "An Investigation of the Properties of Some Feldspars," No. 233 (Sept., 1931).

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PRESENTATION OF ROBERT AUGUSTUS WEAVER FOR THE HONORARY DEGREE OF DOCTOR OF SCIENCE

By Major E. Holmes, Dean, New York State College of Ceramics

Mr. President: The New York State College of Ceramics, engaged as it is in helping to develop the American ceramic industries, observes with much satisfaction the tremendous growth and development of our porcelain enamel industry during the past two decades. America is now independent of foreign nations in this important commodity which finds its way, in one form or another, into virtually every household in the land and which is essential to the presently established scale of living in America. The United States annually produces more than one-half billion dollars worth of products made from porcelain enamel. Of the ceramic industries, only the clay products industry outranks it in importance. The development of the porcelain enamel industry has created jobs for thousands of workmen, a livelihood for hundreds of families, and an outlet for scores of ceramic graduates. America now leads the world in this important phase of modern industry.

The following is the career of the man who has taken the lead in these important developments.

Robert A. Weaver was born at Bradford, Pa., in 1890. In 1912, he was graduated from Kenyon College and started an industrial career which is characterized by a meteoric rise to the highest position that the industry has to offer. He started at the bottom of the ladder as assistant advertising manager of the Eclipse Stove Co., Mansfield, Ohio. His abilities, however, were soon recognized by his promotion to the positions of advertising manager of the Favorite Stove and Range Co., Piqua, Ohio, and sales manager of the Porcelain Enamel & Mfg. Co., Baltimore, Md. These positions were steppingstones to the organization of his own company, which afforded a more adequate outlet for his abilities and vision. In 1920, he founded and became president of the Ferro Enamel Supply Company of Cleveland, Ohio, which was organized to design, build, and install porcelain enameling furnaces, equipment, and complete plants and to sell the porcelain enamel frit manufactured by the Ferro Enameling Company of Cleveland. In 1929, these two companies were consolidated under the name of the Ferro Enamel Corporation, and he has served as its president since its founding. With this Company as a nucleus, he has developed a ceramic service that is world-wide in scope.

In 1933, his Company took over the former Allied Engineering Company of Columbus, Ohio, thereby providing facilities for supplying the clay body branch of the ceramic industry with glaze frit, body fluxes, stains, and the engineering service required for the construction and equipment of kilns and complete ceramic plants. Expansion continued at an increasing tempo until the Company now operates plants not only in the United States but in Canada, England, Holland, France, Brazil, Argentina, and Australia.

Robert Augustus Weaver

Industrial courage, technical vision and, above all, unselfish devotion to the porcelain enamel industry in general instead of to his own Company exclusively have characterized his methods, policies, and objectives. He has developed the industry as a whole, and his Company has shared the benefits with competitors. In 1932, he sponsored in Cleveland the building of the first porcelain enamel-on-steel residence. In 1933–1934, he cosponsored with the American Rolling Mill Company a porcelain enamel-on-steel residence at the Century of Progress Exposition in Chicago. In 1936, he promoted the porcelain enamel-on-steel Exhibition Hall at the Great Lakes Exposi-

tion at Cleveland. These were pioneering ventures which blazed the trail for things to come in housing.

In pointing the way to a new type of house, he has not neglected the aesthetic aspects of human interests. He is a world-wide collector of enamel artware. In 1939, he sponsored the manufacture of the world's largest porcelain enamel-on-steel mural designed by J. Scott Williams, which was displayed on the exterior of the Home Furnishings Building at the New York World's Fair and is now installed in the main concourse of the Union Terminal Building at Cleveland. This mural, 72 feet long and 28 feet high, is an outstanding work of enamel art.

Enamel artware from private collection of Robert A. Weaver

As a means of educating the industry and public in the great possibilities of porcelain enamel, he publishes a trade paper known as *The Enamelist*, which has a wide and effective circulation. He helped organize the Porcelain Enamel Institute and was its first president. This organization brings together the entire enamel industry in the interest of the industry as a whole. He organized the Ferro Enameling School in 1927 with provision for the instruction of his employees and others in the industry in the essentials of the enameling art. Since then, it has developed into the Porcelain Enamel Institute Forum, which has met annually for the discussion of enamel problems.

Neither has he neglected to support higher university education in enamel technology. His Company maintains research fellowships in several ceramic institutions which enable students to earn their way through college, and he is the employer of the largest staff of ceramic graduates of any company of its kind in the country. He is a friend of higher education.

With all of this, he has not neglected to be a good citizen. In his home city of Cleveland, he is an honored and distinguished leader in civic affairs. He is a trustee of the Cleveland Museum of Art, of the Cleveland School of Ceramic Art, and of the Cleveland Playhouse. He is past-president of the Citizens League of Cleveland and of the Ohio Civil Service Council. He is general chairman of the Cleveland Regional Committee of the British War Relief Society, Inc., and is active in the civilian defense work. He is a director of the National City Bank of Cleveland and the Standard Products Company. He is a member of the Cleveland Chamber of Commerce, the Masonic fraternity, and the following clubs: Clifton, Hermit, Mid-Day, Union, Coledon Mountain Trout, and Question Club of Detroit.

This distinguished record has been achieved not by driving but by leading; not by coercion but by encouragement. He minimizes regimentation and red tape; he maximizes the delegation of authority along with responsibility. He always has a ready and sympathetic ear for the problems, both personal and professional, of his employees and associates. As a result, his professional success has been accompanied by the endearment of those who have been privileged to associate with him. He is a distinguished representative of the modern democratic American philosophy of life.

Recognition has already been extended to him. The American Ceramic Society has elected him a Fellow. His alma mater, Kenyon College, has conferred upon him the honorary degree of Doctor of Laws and elected him to its Board of Trustees. Likewise, Alfred University, interested as it is in ceramics, cannot ignore his distinguished services to ceramic education, the ceramic profession, the ceramic industry, and to the cause of good citizenship. It is, therefore, Mr. President, a professional privilege and a personal pleasure to present for the honorary degree of Doctor of Science, Robert Augustus Weaver.

Enamel artware from private collection of Robert A. Weaver

PRESIDENTIAL ADDRESS*

By Jesse Talbot Littleton, D.Sc.

Although it would be fitting to discuss the progress of our ceramic arts and sciences at this time, it seems more appropriate to summarize in a general way the broad functions of this Society. We are at war and we will remain at war for some time. Then there will come a peace. Just what are the relationships of this body to this war and to the peace?

We should not consider ourselves as The American Ceramic Society only, but as an American scientific and engineering unit. We are one member of such groups—one society among others. Our work has not only been national but international in its scope. We, the engineering and scientific societies of this world, have directed and controlled the progress of civilization. We are international. There never has been and never will be such a thing as scientific isolation; it can only exist as scientific stagnation. The only freedom we have ever had is a freedom of thought; scientific societies are the medium for the exchange of this freedom, and our publications are points of contact with the rest of the world.

The arts bear witness to the fact that progress has been international, each nation dependent upon the others for its progress. The German scientist depended upon Bert Maxwell, an Englishman, for the development of the electromagnetic theory of light; the Englishman in turn waited for Max Plank for the mathematics of the radiation theory. In ceramics, Turner in England and Gehlhoff in Germany were mutually dependent upon each other for their progress in glass technology. The microscope used in America was the development product of Abbé and Faraday. The American soldier in the Philippines uses the tetanus vaccine developed from the discoveries of Kitasato, a Japanese, and the Japanese soldier has his life restored to him on the operating table while under the anesthesia developed by American laboratories and first used by American surgeons. In Italy, Austria, and Japan, glass is melted in tanks made from Corhart blocks. Taman and Zschimmer have pointed the thought of Americans, Englishmen, and Frenchmen to the fundamentals of ceramic science. The National Bureau of Standards and the Geophysical Laboratory have exchanged their information with the Reichanstalt. Mme. Curie and the isolation of radium came from Paris and Marconi came from Italy. Pasteur, Lister, and Koch together bring us the possibilities of modern surgery. Civilization has advanced only because of international scientific cooperation. We have all benefited by such contributions.

* Presented at the Forty-Fourth Annual Meeting, The American Ceramic Society, Cincinnati, Ohio, April 20, 1942 (General Session). Received April 19, 1942.

The American Ceramic Society is the American agency and medium for national and international cooperation in ceramics. Through its publications, its meetings, and its abstracts it keeps us in constant touch with our associates the world over. There is no national boundary to science and there is no national limitation to progress in ceramics. The only isolationist is the person who draws into his own shell and excludes the contacts with others that our meetings and publications give him.

But now we are at war. Temporarily, at least, our structures of international cooperation have broken down. Instead, we have substituted international destruction. Societies are now only national units. We are in conflict with similar organized units in enemy countries. We are fighting not only to win this war, but so that we may have a place in the peace to come. Need there be any further reason for the united support of a membership? A time is coming very shortly when the industries we represent will need much more than we can give them. We must prepare for this now. Our Society and its activities are far more essential to our industries now than they have ever been before. The ceramic industry, as gauged by the relative volume of its exports, is the most important peacetime industry of our enemies.

The relative export business of these countries shows the seriousness of our battle. The percentage of world trade in glass and ceramics in 1937 is as follows: Germany 41.11, Czechoslovakia 17.29, United Kingdom 13.91, Japan 11.94, United States 9.20, France 4.57, and Italy 1.51%.

The ceramic industry is more vitally affected by the outcome of this war than is any other major industry. The organizations and people who in 1937 controlled the export business of the world will possibly return; the conditions they must face will force them to produce and try to market a very low-cost but probably high-grade product. The research laboratories and institutions have been developed to such a high degree that the importance of their potentiality cannot be minimized. As active war agents, we must face them now. Their competition will be very serious. This condition can be best faced by a more concerted and united effort on our part. As individuals of our industries, we must be sure that we are neglecting nothing. Our Society, through its meetings and its publications, brings us together and gives us the opportunity to develop and to test our productive ideas. We are united for the purpose of mutual development. We, that is, the industries we represent, are going to need this united effort more than we have ever needed it before.

Be a Leader As Is Dr. Littleton

Leaders Organize and Make Strong Their Organizations by Cooperation

Be a leader by securing the needed larger membership in

The American Ceramic Society, Inc.

SOME MORE LEADERS

ARTHUR A. WELLS

Arthur A. Wells, chairman of the Committee on Research since 1939, will continue to serve The Society in this capacity in 1942–1943.

Arthur Atkinson Wells, Chairman, Committee on Research

Biography

Mr. Wells was born in East Liverpool, Ohio, October 17, 1898. He attended the East Liverpool public schools and Lawrenceville School, Lawrenceville, N. J., from which school he was graduated in 1918. In 1922, he received the Bachelor of Arts degree from Princeton University, Princeton, N. J.

Following his graduation, he became associated with the Homer Laughlin China Company, Newell, W. Va. Here he worked under Albert V. Bleininger until he became plant superintendent in 1928. He has been vice-president and general superintendent of the Company since 1934.

Mr. Wells has been a member of The American Ceramic Society, Inc., since 1923 and was elected to the Fellowship in 1941.

CHARLES J. KOENIG

Charles J. Koenig has been appointed chairman of the Papers and Program Committee of the White Wares Division for 1942–1943.

Biography

Dr. Koenig was born in St. Marys, Ohio, June 3, 1911. He attended the St. Marys grade schools and North High School in Columbus, Ohio, from which school he was graduated in 1928. He then attended Ohio State University, where he received the B.Cer.E., M.Sc., and Ph.D. degrees.

Working under Arthur S. Watts, Dr. Koenig held an Edward Orton, Jr., Foundation Fellowship in 1934–1935. During this time, he studied the fluxes which can be used between cones 010 and 3 to eliminate iron from the composition. Since 1935, he has been associated with the Ohio State University Engineering Experiment Station, where he has been doing research work on nepheline syenite under the direction of George A. Bole.

Charles Jacob Koenig, Chairman, White Wares Division Papers and Program Committee

Dr. Koenig became a member of The American Ceramic Society in 1935 and was elected a Fellow of The Society in April, 1942. He was first appointed to the Papers and Program Committee of the White Wares Division in 1941.

From 1940 to February, 1942, Dr. Koenig was chairman of the Central Ohio Section of The American Ceramic Society.

He is also a member of the Institute of Ceramic Engineers, Keramos, Sigma Xi, and Sigma Gamma Epsilon.

Publications

(1) (With A. S. Watts) "Durability of Tableware Decorations," *Jour. Amer. Ceram. Soc.*, **17** [9] 259–62 (1934).

(2) "Syenite in Ceramic Bodies," *Ceram. Ind.*, **25** [6] 338–39 (1935).

(3) "Spit-Out," *Jour. Amer. Ceram. Soc.*, **19** [10] 287–94 (1936).

(4) "Use of Syenite in Semivitreous Ware: I, (*a*)

Physical Properties of Bisques; (*b*) Glaze Containing Syenite," *ibid.*, pp. 295–98; II, Plant Trials," *ibid.*, **20** [5] 148–52 (1937).

(5) "Use of Syenites in Semivitreous Ware," *Ohio State Univ. Eng. Expt. Sta. Bull.*, No. 94, 22 pp. (1937).

(6) "Method of Classifying Particle Shapes," *Brick & Clay Record*, **91** [6] 314 (1937).

(7) "Use of Nepheline Syenite in Ceramic Products," *Jour. Can. Ceram. Soc.*, **7**, 36–39 (1938).

(8) "Nepheline Syenite in Ceramic Ware," *Ohio State Univ Eng. Expt. Sta. Bull.*, No. 103, 74 pp. (1939).

(9) "Fundamental Properties of Nepheline Syenite," *Jour. Amer. Ceram. Soc.*, **22** [2] 35–38 (1939).

(10) "Use of Nepheline Syenite in Sanitary Porcelain," *ibid.*, pp. 38–46.

(11) "Use of Nepheline Syenite in Floor- and Wall-Tile Bodies," *ibid.*, **23** [3] 86–91 (1940).

(12) (With H. J. Orlowski) "Thermal Expansion of Silicate Fluxes in the Crystalline and Glassy States," *ibid.*, **24** [3] 80–84 (1941).

(13) "Nepheline Syenite in Hotel Chinaware Bodies," *ibid.*, **25** [3] 90–93 (Feb., 1942).

(14) "Low-Temperature Vitreous Bodies," *ibid.*, [9] 230–36 (May, 1942).

R. A. Shipley, Chairman, Structural Clay Products Division

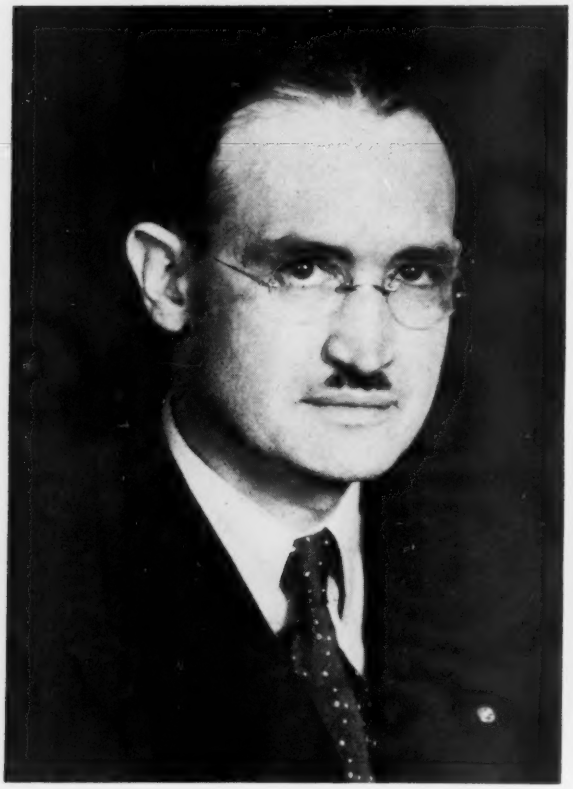
John Henry Isenhour, Past-Chairman (1941–1942), Structural Clay Products Division

Roger Lee Fellows, Past-Chairman (1941–1942), Enamel Division

(1942)

Karl Kautz, Chairman, Enamel Division

John Richard Kauffman, Secretary, Materials and Equipment Division



William Raymond Kerr, Secretary, Refractories Division

Harry Custer Plummer, Director of Engineering and Research, Structural Clay Products Institute, Washington, D. C.

John Weed Whittemore, Trustee, Ceramic Educational Council, 1941 -1944

INSTITUTE OF CERAMIC ENGINEERS

President: H. M. KRANER, Bethlehem Steel Co., Bethlehem, Pa.
Vice-President: H. B. DUBOIS, Consolidated Feldspar Corp., Trenton, N. J.
Secretary: H. G. SCHURECHT, New York State College of Ceramics, Alfred, N. Y.
Past-President: E. H. FRITZ, Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
Trustee Representative: H. G. WOLFRAM, Porcelain Enamel & Mfg. Co., Baltimore, Md.

MINUTES OF ANNUAL MEETING

The annual meeting of the Institute of Ceramic Engineers was held in the Netherland Plaza Hotel, Cincinnati, Ohio, on Tuesday, April 21, 1942, at 4:30 P.M., with President E. H. Fritz presiding. Approximately fifty-five members were present.

(1) President's Report

Mr. Fritz reported on the activities of the Institute during the year, with special emphasis on the attempts to have students in ceramic engineering deferred by the draft boards.

It was decided not to contribute $100 toward the Enamel Bibliography, as the Institute was requested to do.

(2) Committee on Proposed Amendments to Rules of the Institute

This report was presented by M. F. Beecher. The elimination of the junior member grade was discussed. It was moved by A. F. Greaves-Walker and seconded by A. S. Watts that the proposal to eliminate the junior member grade be tabled; the motion was carried.

It was moved by R. K. Hursh and seconded by T. N. McVay that proposals to revise section 7 (*d*) under Article EIR III be tabled; the motion was carried.

(3) Committee on Ceramic Education

R. M. Campbell reported that Corporation Members of The American Ceramic Society, Inc., had been contacted; in response, thirty-seven of such companies made eighty-four suggestions for research by ceramic colleges. The problems as received were submitted to the department heads of the ceramic colleges.

It was suggested that the Institute offer a prize to the senior carrying out the best research work in each college, but owing to the national emergency it was thought inadvisable to start this competition at the present time.

(4) Committee on Membership

A. S. Watts reported by letter to the president. This Committee handled 128 applications since last year. Twenty-two of these were granted full membership, thirty-two associate membership, and thirty-three junior membership; twenty-nine were rejected. We now have 375 members, 145 of which are charter members, 61 members, 117 associate members, and 52 junior members.

(5) Committee on Professional Status and Development

R. E. Birch reported that the purpose of this Committee was (1) to seek means of improving the professional status of ceramic engineers through publicity and contact with other organizations of engineers, (2) to develop means for encouraging a desirable type of high school student to enter the departments of ceramic engineering through the publication of articles, booklets, etc., and (3) to develop a program for young ceramic engineering graduates.

Owing to new conditions brought about by the war, it was decided to appoint a committee to determine in what field there is a shortage of engineers and to work in cooperation with the draft boards in deferring men for such work.

It was decided to appoint another committee to investigate possible unemployment in nonessential industries to ascertain if these can be transferred to essential industries.

It was also decided to appoint a special committee to re-examine the qualifications for membership in the Institute by questionnaires and other methods.

(6) Committee on State Boards of Engineering Examiners and Engineers, Council for Professional Development

A. F. Greaves-Walker submitted a report for this Committee.

(7) Committee on Activities

J. L. Carruthers submitted the report of this Committee recommending eight new activities for the Institute which were voted upon separately and were all passed by the membership.

(8) Report of Secretary-Treasurer

H. B. DuBois reported that his principal duties during the past year have been in connection with membership applications.

There was a balance on hand of $630.20 in December, 1940. The receipts through March, 1941, were $1219.98; the disbursements were $501.04, leaving a balance of $1349.14.

Nine members owe for four-year assessments, four for three years, twenty-one for two years, and fifty-two for the 1942 assessment.

NEW MEMBERS

Member Grade

EDWARD C. HENRY, 723 Jackson St., State College, Pa.

Associate Member Grade

GEORGE L. VINCENT, 134 W. Wright St., Milwaukee, Wis.

—H. B. DUBOIS, *Secretary*

MINUTES OF ANNUAL MEETING OF THE FELLOWS

The twelfth annual meeting of the Fellows was held at the Netherland Plaza Hotel at 2:30 P.M., April 19, 1942, Dean Robert B. Sosman, presiding.

The published minutes of the preceding annual meeting were approved (see *Bull. Amer. Ceram. Soc.*, **20** [6] 221 (1941)). The Dean presented his report for the year.

The Dean then reported that nineteen nominees to the Fellowship had been approved by the Fellowship Board. It was moved and seconded that the rules be suspended, that the nineteen nominees be recommended for election by the Board of Trustees, and that the Fellowship Board be requested to observe more carefully the rules concerning limitation of the annual elections to ten. This was amended to the effect that no nominees be approved for admission next year, in order to keep the annual average near ten. The motion as amended was carried. It was voted that a Rules Committee be appointed to study and report upon the method of election of Fellows.

Alexander Silverman, reporting as chairman of the Committee on Honorary Membership, nominated Ross C. Purdy to Honorary Membership in The Society. He was unanimously elected.

Robert Maynard King, Secretary-Treasurer of the Fellows

The Dean reported that there had been no activity by the Committee on a History of Ceramic Education, but called attention to a recent book by T. T. Read entitled The Development of Mineral Industry Education in the United States. He called particular attention to a chapter on the history of education in ceramics and mentioned the possibility of having this chapter expanded into a book on the subject. It was voted that the matter be referred to a new committee to be appointed by the Dean on nomination by the Ceramic Educational Council.

The special order of business for the meeting was a discussion on The American Ceramic Society's role in ceramic standardization, which was led by Arthur S. Watts, a former chairman of the Committee on Standards; John D. Sullivan, chairman of Committee C-8 on Refractories, American Society for Testing Materials; Frederick Heath, Jr., The Society representative in Project A-62 of the American Standards Association; and J. W. Whittemore, chairman of the Committee on Standards.

By authorization of the Board of Trustees, the Fellows then received and discussed reports from several of the technical committees of The Society and from The Society's representatives in other organizations. The following reports were made: Geological Surveys (Heinrich Ries), Data (Dwight G. Bennett), Dust Hazard (Edward Schramm), A.S.T.M. Committee C-8 on Refractories (Nelson W. Taylor), and A.S.T.M. Committee C-15 on Manufactured Masonry Units (Frederick Heath, Jr.). Other reports had been submitted to J. W. Whittemore, chairman of the Committee on Standards, who made a general report (see *Bull. Amer. Ceram. Soc.*, **21** [6] 101–105 (1942)). Alexander Silverman reported on the activities of his Committee on Chemical Data for Ceramists, which is under the auspices of the Division of Chemistry and Chemical Technology, National Research Council. Dean Sosman reported for the Division of Geology and Geography of the National Research Council.

At the suggestion of Chairman Bennett, it was voted that it be recommended to the Board of Trustees that the Committee on Data be discontinued.

Several suggestions as to representatives on committees of the American Society for Testing Materials and the American Standards Association, replacing absent or inactive representatives, were received for transmittal to the Board of Trustees.

It was voted that the Geological Society of America be requested to publish the state maps prepared by Heinrich Ries which show the distribution of clays, in case The Society's own funds were found to be insufficient for the purpose.

The Dean reported the status of Fellowship funds.

The election of R. M. King, Ohio State University, Columbus, Ohio, as Secretary-Treasurer for the term 1942–1945 was announced.

The meeting adjourned at 5:30 P.M.

—R. M. KING, *Acting Secretary*

DO LIKEWISE

NEW MEMBERS FOR JUNE

Corporation

DETRICK, M. H., Co., L. Hosbein (voter), 140 S. Dearborn St., Chicago, Ill.

POLAROID CORP., D. B. Hummel (voter), 730 Main St., Cambridge, Mass.

Personal

GILLIARD, JOSEPH W., Box 213, Hampton Institute, Hampton, Va.; ceramic art teacher.

GREENE, CHARLES H., 230 Chemung St., Corning, N. Y.; glass technologist, Corning Glass Work.

HAAG, FRANCIS E., United Feldspar & Minerals Corp., 10 East 40th St., New York, N. Y.; president.

IRION, CLARENCE E., 84 Hawthorne Rd., Essex Fells, N. J.; manager, Machine Development Div., Kimble Glass Co.

KLOCKE, EDWARD J., Box 256, Newport, Ky.; auditor, H. C. Spinks Clay Co.

KNAPP, JAMES L., 62 West Ave., Wellsboro, Pa.; control chemist, Wellsboro Div., Corning Glass Works.

MITCHELL, STEPHEN A., 719 Woodward Ave., Kittanning, Pa.; assistant maintenance superintendent, Eljer Pottery Co.

MULLER, FREDERICK W., 959 Edgemoor Court, Lancaster, Pa.; manager, Insulating Refractories Dept., Armstrong Cork Co.

PASS, JAMES S., 410 S. Avery Ave., Syracuse, N. Y.; Pass & Seymour, Inc., Solvay, N. Y.
WINBURN, SINCLAIR W., 303 South St., Benton, Ark.; superintendent and vice-president, Niloak Pottery.

Student

Massachusetts Institute of Technology: ELI FOX.
New York State College of Ceramics: ALFRED E. AUSTIN.
Ohio State University: D. EDGAR HOLMGREN AND RUSSELL E. LONG.
Rutgers University: HERBERT G. UELTZ.
University of North Carolina: WILLIAM WATSON.

MEMBERSHIP WORKERS' RECORD

Corporation

R. E. Birch	1	J. C. Hostetter	1

Personal

C. V. Myers	1	W. C. Taylor	1
L. J. Trostel	8		

Student

G. H. Brown	1	F. H. Norton	1
L. J. Trostel	4		

Grand Total 18

ROSTER CHANGES DURING JUNE*

Corporation

CERTAIN-TEED PRODUCTS CORP., Attn. B. E. Fennessy, 120 S. LaSalle St., Chicago, Ill. (A. R. Mueller, Buffalo, N. Y.)
CLARK, N., & SONS, Attn. G. D. Clark, Jr., 401 Pacific Ave., Alameda, Calif. (San Francisco, Calif.)

Personal

ARRANCE, FRANK C., Risingsun, Ohio (Alfred, N. Y.)
BALDWIN, WILLIAM J., Crane Co., 836 S. Michigan Ave., Chicago, Ill. (Chattanooga, Tenn.)
BRETZ, LEWIS A., 477 E. Ford Ave., Barberton, Ohio (East Liverpool, Ohio)
BUCHHOLZ, RUSSELL A., 935 Sewell Ave., Cape May City, N. J. (Oak Park, Ill.)
CLINE, ROBERT W., Box 449, Silver Spring, Md. (Takoma Park, Md.)
COOK, HERMAN L., O. Hommel Co., 209 4th Ave., Pittsburgh, Pa. (Dayton, Ohio)
CREW, HORACE F., Square D Co., Peru, Ind. (Columbus, Ohio)
CUMMINS, ARTHUR B., 602 E. Front St., Plainfield, N. J. (Millington, N. J.)
CURTIS, THOMAS S., 2719 Hyperion Ave., Los Angeles, Calif. (Huntington Park, Calif.)

* Address in parentheses is former address.

DESAIX, HERBERT A., 320 East 7th St., Plainfield, N. J. (Hawthorne, N. J.)
DOUGAN, CHARLES W., Missouri School of Mines and Metallurgy, Rolla, Mo. (Glendale, Calif.)
FALLON, FRANK J., 1085 Tuxedo Square, Teaneck, N. J. (Glendale, N. Y.)
GREAVES-WALKER, A. F., Chief, Nonmetals Section, War Production Board, Washington, D. C. (Raleigh, N. C.)
GRIFFITH, ALFRED P., 3937 Edgehill Dr., Los Angeles, Calif. (South Gate, Calif.)
HANKS, CHARLES F., JR., 801 S. Mercer Ave., Bloomington, Ill. (El Cerrito, Calif.)
HEATH, FREDERICK, JR., Owens-Corning Fiberglas Corp., Toledo, Ohio (Worcester, Mass.)
HEDQUIST, ALFRED J., 837 Phoenix Ave., Chester, W. Va. (Buffalo, N. Y.)
HELSER, PERRY D., 703 McNeil Rd., Silver Spring, Md. (White Plains, N. Y.)
HUBLER, WILLIAM G., Ventures, Limited, 25 King St., W., Toronto, Ontario, Canada (Rochester, N. Y.)
HUNT, JOHN F., 490 S. Lincoln Ave., Salem, Ohio (Jackson, Mich.)
JONES, HARLOW G., General Delivery, Rolla, Mo. (Owosso, Mich.)
KENAGY, WILLIAM L., Huntingdon Valley, Pa. (Philadelphia, Pa.)
KERR, VAUGHN W., 653 Beverly Rd., Mt. Lebanon, Pa. (Washington, Pa.)
KOHL, HANS, c/o F. A. Kertess, 10 East 40th St., New York, N. Y. (Wiesenau 8, Germany)
KURZ, WALTHER, 81 Smith St., Perth Amboy, N. J. (Newark, N. J.)
LAMBE, C. MILTON, JR., 413 Calvin Rd., Raleigh, N. C. (Ford City, Pa.)
LESAR, ALBERT R., 716 Curtis St., Mexico, Mo. (Montezuma, Ind.)
MASON, PVT. LLOYD W., Company A, 121st Infantry, A.P.O.8, U. S. Army, Fort Jackson, S. C. (Fort McClellan, Ala.)
MATSON, FREDERICK R., 2224 Decatur Place, N. W., Washington, D. C. (Ann Arbor, Mich.)
MCCUTCHEON, EARL S., 1103 E. Washington St., Washington, Iowa (Athens, Ga.)
MORRIS, GEORGE J., Box 1, Sykesville, Pa. (Clearfield, Pa.)
REED, HEROLD N., 416 W. Laurel St., Willard, Ohio (Niles, Mich.)
SCHOFIELD, H. ZANE, A C Spark Plug Div., General Motors Co., Flint, Mich. (Zanesville, Ohio)
STUCKEY, ROBERT C., JR., 1722 19th St., N. W., Apt. 401, Washington, D. C. (Charlotte, N. C.)
WELLIVER, WILLIAM E., Georgia Kaolin Co., 1185 Mary St., Elizabeth, N. J. (Columbus, Ohio)
WILLIAMS, ARTHUR E., 5510 Wisconsin Ave., Washington, D. C. (Moundsville, W. Va.)
WRIGHT, ANN T., College Club, 40 Commonwealth Ave., Boston, Mass. (Minneapolis, Minn.)

STANDING COMMITTEES FOR 1942–1943

Executive Committee, Board of Trustees

LOUIS J. TROSTEL (*ex-officio*): General Refractories Co., Baltimore, Md.
J. T. LITTLETON: Corning Glass Works, Corning, N. Y.
M. E. HOLMES: New York State College of Ceramics, Alfred, N. Y.
J. E. HANSEN: Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio
J. D. SULLIVAN: Battelle Memorial Institute, Columbus, Ohio
L. E. BARRINGER: General Electric Co., Schenectady, N. Y.

(1942)

Finance Committee, Board of Trustees

J. E. HANSEN, *Chairman*, Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio
C. FORREST TEFFT: Claycraft Co., Box 866, Columbus, Ohio
J. L. CARRUTHERS: Dept. of Ceramic Engineering, Ohio State Univ., Columbus, Ohio

Committee on Rules

W. KEITH MCAFEE, *Chairman*, Universal Sanitary Mfg. Co., New Castle, Pa. (assisted by the chairman of the Rules Committee of each Class and Division)

Committee on Publications

D. E. SHARP, *Chairman*, Hartford-Empire Co., Hartford, Conn.
E. E. MARBAKER: Mellon Institute, Pittsburgh, Pa.
J. B. AUSTIN: Research Lab., U. S. Steel Corp., Lincoln Highway, Kearny, N. J.
G. H. SPENCER-STRONG: Porcelain Enamel & Mfg. Co., Baltimore, Md.
R. C. PURDY (*ex-officio*): The American Ceramic Society, Inc., 2525 N. High St., Columbus, Ohio

Committee on Membership

R. E. BIRCH, *Chairman*, Harbison-Walker Refractories Co., Pittsburgh, Pa. (assisted by the chairman of the Membership Committee of each Class and Division)

Committee on Standards

J. W. WHITTEMORE, *Chairman*, Virginia Polytechnic Institute, Blacksburg, Va.
Subcommittee A on Definitions
EMILY C. VAN SCHOICK, *Chairman*, The American Ceramic Society, Inc., 2525 N. High St., Columbus, Ohio
J. B. AUSTIN: Research Lab., U. S. Steel Corp., Lincoln Highway, Kearny, N. J.
H. T. COSS: Research Lab., Johns-Manville Corp., Manville, N. J.
Subcommittee B on Raw Material Specifications
(No appointments)
Subcommittee C on Standardization of Tests
(One member from each Division)
Subcommittee D on Standardization of Products
(One member from each Division)

Committee on Sections and Divisions

A. I. ANDREWS, *Chairman*, Dept. of Ceramic Engineering, Univ. of Illinois, Urbana, Ill.
REXFORD NEWCOMB, JR.: Bureau of Industrial Conservation, War Production Board, Washington, D. C.
E. P. POSTE: 309 McCallie Ave., Chattanooga, Tenn.
E. E. MARBAKER: Mellon Institute, Pittsburgh, Pa.
D. G. BENNETT: Mellon Institute, Pittsburgh, Pa.
E. P. MCNAMARA: Division of Mineral Industries Extension, Mineral Industries Bldg., State College, Pa.
(Assisted by the chairman of each Division)

Committee on Research

ARTHUR A. WELLS, *Chairman*, Homer Laughlin China Co., Newell, W. Va. (assisted by a member from each Division)

Committee on Geological Surveys

H. RIES, *Chairman*, 401 Thurston Ave., Ithaca, N. Y.
J. E. LAMAR: State Geology Div., Univ. of Illinois, Urbana, Ill.
O. C. RALSTON: Nonmetals Div., U. S. Bureau of Mines, College Park, Md.
F. K. PENCE: Univ. of Texas, Div. of Industrial Chemistry, Austin, Tex.
HEWITT WILSON: Electrotechnical Lab., U. S. Bureau of Mines, Norris, Tenn.
NORMAN PLUMMER: State Geological Survey of Kansas, Lawrence, Kans.
A. F. GREAVES-WALKER: Nonmetals Section, War Production Board, Washington, D. C.

Committee on Data

F. P. HALL, *Chairman*, Onondaga Pottery Co., Syracuse, N. Y. (assisted by a member from each Divison)

Committee on Ceramic Education

C. M. DODD, *Chairman*, Dept. of Ceramic Engineering, Iowa State College, Ames, Iowa (Education Member, 1 year)
G. J. EASTER: Carborundum Co., Niagara Falls, N. Y. (Industry Member, 2 years)
J. S. GREGORIUS: Pittsburgh Plate Glass Co., Creighton, Pa. (Technology Member, 3 years)
ALICE A. AYARS: 12479 Cedar Rd., Cleveland Heights, Ohio (Art Member, 4 years)
H. M. KRANER: Research Dept., Bethlehem Steel Co., Bethlehem, Pa. (Engineering Member, 5 years)

Committee on Industrial Management

W. KEITH MCAFEE, *Chairman*, Universal Sanitary Mfg. Co., New Castle, Pa. (assisted by a member from each Division)

Committee on Patents

F. B. FLICK, *Chairman*, 1706 First National Bank Bldg., Pittsburgh, Pa.
J. C. HOSTETTER: Hartford-Empire Co., Hartford, Conn.
F. H. RIDDLE: Champion Spark Plug Co., Detroit, Mich.

Committee on Film Library

H. E. SIMPSON, *Chairman*, Mellon Institute, Pittsburgh, Pa.
C. R. AUSTIN: Battelle Memorial Institute, Columbus, Ohio
R. C. PURDY: The American Ceramic Society, Inc., 2525 N. High St., Columbus, Ohio

Committee on Dust Hazard (Air Hygiene)

F. C. FLINT, *Chairman*, Hazel-Atlas Glass Co., Washington, Pa.
EDWARD SCHRAMM: Onondaga Pottery Co., Syracuse, N. Y.
V. P. AHEARN: National Industrial Sand Association, 951 Munsey Bldg., Washington, D. C.
L. H. MILLIGAN: Norton Co., Worcester, Mass.
L. M. MERRITT: Div. of Safety and Hygiene of Ohio, Industrial Commission, Columbus, Ohio

Advisory Board for Cooperation with U. S. Government

A. F. GREAVES-WALKER: Nonmetals Section, War Production Board, Washington, D. C. (Education, Ceramic Engineering)
A. I. ANDREWS: Univ. of Illinois, Urbana, Ill. (Enamel)
G. W. MOREY: Geophysical Laboratory, Washington, D. C. (Glass)
HEWITT WILSON: Electrotechnical Lab., U. S. Bureau of Mines, Norris, Tenn. (Ceramic Materials)
H. M. KRANER: Bethlehem Steel Co., Bethlehem, Pa. (Refractories)
E. F. PLUMB: Streator Brick Co., Streator, Ill. (Structural Clay Products)
F. H. RIDDLE: Champion Spark Plug Co., Detroit, Mich. (White Wares)

SPECIAL COMMITTEES

Committee on Nonmember Registration Fee

V. V. KELSEY, *Chairman*, Dominion Minerals, Inc., Shoreham Bldg., Washington, D. C.
J. W. WHITTEMORE: Virginia Polytechnic Institute, Blacksburg, Va.
W. KEITH MCAFEE: Universal Sanitary Mfg. Co., New Castle, Pa.

Committee on Status of Ceramic Engineers with Selective Service Boards

A. I. ANDREWS, *Chairman*, Dept. of Ceramic Engineering, Univ. of Illinois, Urbana, Ill.
M. E. HOLMES: New York State College of Ceramics, Alfred, N. Y.

A. S. WATTS: Dept. of Ceramic Engineering, Ohio State Univ., Columbus, Ohio
C. E. BALES: Ironton Fire Brick Co., Ironton, Ohio
E. H. FRITZ: Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.

Committee on Promotion and Development Secretary

C. E. BALES, *Chairman*, Ironton Fire Brick Co., Ironton, Ohio
J. L. CARRUTHERS: Dept. of Ceramic Engineering, Ohio State Univ., Columbus, Ohio
F. C. FLINT: Hazel-Atlas Glass Co., Washington, Pa.
J. E. HANSEN: Ferro Enamel Corp., 4150 E. 56th St., Cleveland, Ohio.
W. KEITH MCAFEE: Universal Sanitary Mfg. Co., New Castle, Pa.
D. E. SHARP: Hartford-Empire Co., Hartford, Conn.
J. D. SULLIVAN: Battelle Memorial Institute, Columbus, Ohio.

APPOINTED REPRESENTATIVES FOR 1942–1943

American Association for the Advancement of Science

R. C. PURDY: The American Ceramic Society, Inc., 2525 N. High St., Columbus, Ohio

American Foundrymen's Association

L. C. HEWITT, Laclede-Christy Clay Products Co., St. Louis, Mo.

American Society for Testing Materials

Committee A–1 on Steel: H. F. STALEY, Metal & Thermit Corp., 120 Broadway, New York, N. Y.
Committee C–8 on Refractories: J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.
Committee C–11 on Gypsum: R. F. GELLER, National Bureau of Standards, Washington, D. C.
Committee C–14 on Glass and Glass Products: G. W. MOREY, Geophysical Laboratory, Washington, D. C.
Committee C–15 on Manufactured Masonry Units: FRED-FREDERICK HEATH, JR., Owens-Corning Fiberglas Corp., Toledo, Ohio
Committee D–3 on Gaseous Fuels: C. H. PARMELEE, Onondaga Pottery Co., Syracuse, N. Y.
Committee D–9 on Electrical Insulating Materials: L. E. BARRINGER, General Electric Co., Schenectady, N. Y.
Committee D–5 on Coals: A. W. GAUGER, Pennsylvania State College, State College, Pa.

American Society of Mechanical Engineers

Petroleum Division: H. R. STRAIGHT, Straight Engineering Co., Adel, Iowa
Process Division: W. KEITH MCAFEE, Universal Sanitary Mfg. Co., New Castle, Pa.

American Standards Association

Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment (Project A–40): HARRY WHITTAKER, Research Laboratories, Crane Co., Chicago, Ill.
Sectional Committee on Recommended Practice for Brick Masonry (Project A–41): J. W. WHITTEMORE, Virginia Polytechnic Institute, Blacksburg, Va.
Sectional Committee on Coordination of Dimensions of Building Materials and Equipment (Project A–62): FREDERICK HEATH, JR., Owens-Corning Fiberglas Corp., Toledo, Ohio
Sectional Committee on Insulators for Electric Power Lines (Project C–29): G. W. LAPP, Lapp Insulator Co., Le Roy, N. Y.
Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Project Z–10): RALSTON RUSSELL, JR., Research Laboratories, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Sectional Committee on Specifications for Sieves for Testing Purposes (Project Z–23): A. S. WATTS, Dept. of Ceramic Engineering, Ohio State Univ., Columbus, Ohio
Sectional Committee on Specifications and Methods of Test for Safety Glass (Project Z–26): GEORGE WATKINS, Libbey-Owens-Ford Glass Co., Toledo, Ohio; D. E. SHARP (alternate), Hartford-Empire Co., Hartford, Conn.

International Association for Testing Materials

S. M. PHELPS: Mellon Institute, Pittsburgh, Pa.

International Commission on Glass Technology

J. C. HOSTETTER: Hartford-Empire Co., Hartford, Conn

International Chemical Congress

ALEXANDER SILVERMAN: Dept. of Chemistry, Univ. of Pittsburgh, Pittsburgh, Pa.

Inter-Society Color Council

WOLDEMAR WEYL, *Chairman*, Dept. of Ceramics, Pennsylvania State College, State College, Pa.
R. S. HUNTER: National Bureau of Standards, Washington, D. C.
CAMPBELL ROBERTSON: E. I. du Pont de Nemours & Co., Inc., Perth Amboy, N. J.
A. S. WATTS: Dept. of Ceramic Engineering, Ohio State Univ., Columbus, Ohio
J. H. KOENIG: 3007 Neil Ave., Columbus, Ohio
C. H. ZWERMANN: 176th Engr., Camp Bowie, Tex.
H. D. CALLAHAN: U. S. Quarry Tile Co., East Sparta, Ohio
F. P. HALL: Onondaga Pottery Co., Syracuse, N. Y.
R. F. BRENNER: Anchor Hocking Glass Co., Lancaster, Ohio
J. D. TETRICK: Du Pont Electrochemicals Dept., E. I. du Pont de Nemours & Co., Inc., Perth Amboy, N. J.

Illuminating Society and Luminous Glassware Guild

W. C. TAYLOR, *Chairman*, Corning Glass Works, Corning, N. Y.
R. A. MILLER: Pittsburgh Plate Glass Co., Pittsburgh, Pa.
R. R. SHIVELY: B. F. Drakenfeld & Co., Inc., Washington, Pa.
A. N. FINN: National Bureau of Standards, Washington, D. C.
H. H. BLAU: Federal Glass Co., Columbus, Ohio

National Research Council

Division of Geology and Geography: G. W. MOREY, Geophysical Laboratory, Washington, D. C.
Division of Chemistry and Chemical Technology: G. W. MOREY

Orton Foundation Board

L. E. BARRINGER: General Electric Co., Schenectady, N. Y.

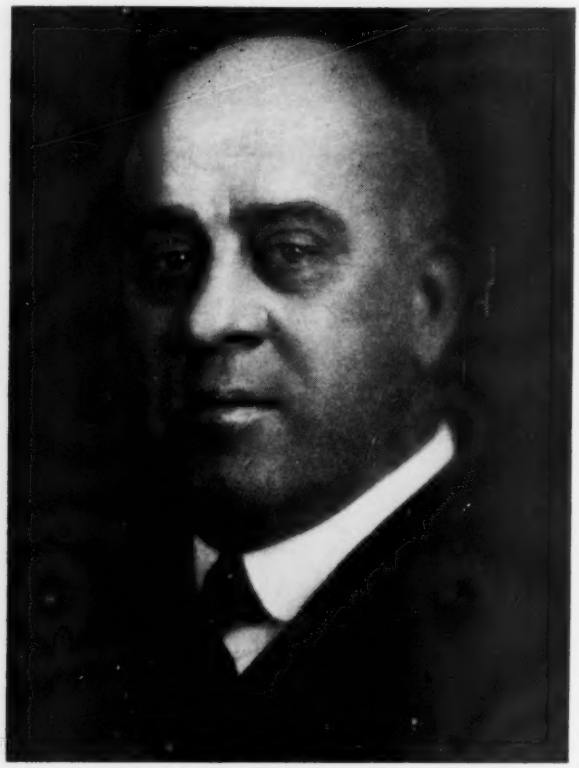
United States Department of Commerce, Division of Simplified Practice: Permanent Committee on Simplification of Variety and Standards of Vitrified Paving Brick

C. C. BLAIR: Metropolitan Paving Brick Co., Canton, Ohio

NECROLOGY

JOHN R. KEMPF

John R. Kempf, president and treasurer of the Detroit-Star Grinding Wheel Co., Detroit, Mich., died on June 5, 1942, following a heart attack.



John R. Kempf

Born at Chelsea, Mich., June 23, 1869, Mr. Kempf was a graduate of the Michigan Military Academy and of the University of Michigan. Following his graduation from the University in 1890, he became associated with the Detroit Electrical Works. From 1891 to 1893 he was employed by the Homestead Steel Works of the Carnegie Steel Company and from 1893 to 1899 by the National Cash Register Co., Dayton, Ohio. In 1899, he purchased the Star Corundum Wheel Company in Detroit and managed the Company until 1919, when it was consolidated with the Detroit Grinding Wheel Company under the name Detroit-Star Grinding Wheel Company.

At the time of his death, Mr. Kempf was also vice-president and director of the General Abrasive Co., Niagara Falls, N. Y.

Mr. Kempf had been a member of The American Ceramic Society since 1917. He was also a member of Delta Tau Delta fraternity, the Detroit Club, the Detroit Athletic Club, the Old Club, the Essex County Golf and Country Club, the University of Michigan Club, the Detroit Board of Commerce, and the University of Michigan Union.

He is survived by a daughter, Mrs. Henry J. Cupper, two grandchildren, and a sister, Mrs. Nell K. Close of Toledo, Ohio.

WILLIAM L. MONRO, JR.*

William L. Monro, Jr., aged 49, executive vice-president of the American Window Glass Company, died at St. Francis Hospital, Pittsburgh, Pa., on June 10. He was the son of William L. and Violet Kennedy Bedell Monro, of East End, Pittsburgh. The deceased had been in ill health for several months, and on June 9 he became critically ill.

Mr. Monro, after completing his public school education in Pittsburgh, entered the Shadyside Academy; he then went to Harvard, where he was graduated in 1916. At the beginning of the Mexican War, he enlisted in the First Massachusetts Artillery and spent six months on the Mexican border. He next took a one-year course in the Harvard Law School.

When war was declared against Germany in 1917, Mr. Monro joined the First Officers Training Camp at Plattsburg, N. Y., and was later commissioned Second Lieutenant of Field Artillery. He was ordered to France immediately upon being commissioned and attended the Field Artillery schools at Fontainebleau and Saumur.

In January of 1918, he was ordered to Camp Le Valdahon as artillery instructor to the Second F.A. Brigade of the Second Division. Next he was assigned to the Twelfth F.A. of the Second Brigade and moved to the Verdun front with that organization in March, 1918. While on this front, he served as liaison officer between the Twelfth F.A. and the French Heavy Artillery in that sector. As a battery and battalion officer of this regiment, which supported the Fifth and Sixth Marines, he took part in fighting at Château-Thierry and Soissons and was gassed during the latter engagement.

In August, 1918, he was made First Lieutenant and assigned as operations officer at the Artillery headquarters of the Third Army Corps, which was engaged on the Aisne and Vesle fronts. In October of that year, he returned to the Twelfth F.A. and participated in the drive in the Champagne sector. On November 1, 1918, he was appointed aide-de-camp to General Manus McCloskey, then commanding the 152d F.A. Brigade of the 77th Division and was with this Division during the final drive in the Meuse-Argonne campaign. The morning of November 11, 1918, found the guns of the 152d F.A. Brigade trained on Sedan.

With this organization he spent several months in the Army of Occupation at Neuwied, Germany. A distinct honor bestowed upon Mr. Monro in 1919 was his assignment as an officer of President Wilson's guard at the Paris White House. He served in this capacity until ordered back to the United States in the latter part of June of that year. He was awarded the Croix de guerre by Corps Citation of the French Armies of the East in recognition of his services at Château-Thierry.

Upon returning home, Mr. Monro went to the American factory at Belle Vernon, Pa., in the capacity of a teaser. Then going from one position to another, he studied the different operations encountered in the production of window glass by the machine process. From Belle Vernon he went to Jeannette, Pa.

In the early part of 1920, accompanied by his father, Mr. Monro went to Europe on a business mission. While there, they made a survey of the flat-glass industry. Returning to the United States in the fall of 1920, Mr. Monro went to the company's factory at Monongahela City, Pa., in the capacity of tank foreman.

The year 1922 was spent by him in visiting the other factories of the American company at Kane and Arnold, Pa., and Hartford City, Ind. During the early part of 1923, he visited different sales offices of the American company located in large cities, spending some time at each one of them.

Mr. Monro made his third trip to Europe in the summer of 1923, at which time he made a study of window-glass plants equipped with Fourcault machines in Czechoslovakia, Belgium, Germany, and Italy. He also worked with the St. Gobain Company at Chalon-sur-Saône and was instrumental in improving the quality and production of that factory.

* From *National Glass Budget*, **58** [7] 1, 10 (June 13, 1942).

Returning to the United States in the summer of 1924, he was located in the general offices of the company in Pittsburgh. In 1925, he was made assistant to the president of the American Window Glass Company. In 1929, he became superintendent of American factories and four years later was advanced to executive vice-president, the position he held at the time of his death.

CARL H. LAWSON

Carl H. Lawson, superintendent of the Waltham Grinding Wheel Co., Waltham, Mass., died on May 4, 1942.

Mr. Lawson was born in Fall River, Mass., in 1893. In 1908, he became associated with the Norton Co., Worcester, Mass., where he served an apprenticeship for five years in the plant. In 1913, he entered the research laboratory of the same Company to work under Ross C. Purdy (then research director).

Carl H. Lawson

After spending eight years doing factory research work at the Norton Company, Mr. Lawson became superintendent of the Waltham Grinding Wheel Company in 1921.

Active in civic and church affairs, Mr. Lawson was president of the Men's Society of Christ Church and former secretary of the Waltham Rotarians. He was also the recipient of an honor for Industrial Research which was awarded to him by the Waltham Chamber of Commerce.

Mr. Lawson became an associate member of The American Ceramic Society in 1917 and an active member in 1923. He also served as Secretary-Treasurer of the Northeastern Section of The Society in 1923.

SCHOOL NOTES

NEW YORK STATE COLLEGE OF CERAMICS

Honorary Ceramic Degrees, 1942

Honorary Degree of Doctor of Science: ROBERT A. WEAVER, Ferro Enamel Corp., Cleveland, Ohio.

Charles Fergus Binns Medal: HAROLD S. NASH, Dept. of Ceramics, Univ. of Cincinnati, Cincinnati, Ohio.

Professional Degree of Ceramic Engineer: DONALD E. SHARP, Hartford-Empire Co., Hartford, Conn.; SAMUEL F. WALTON, Exolon Co., Blasdell, N. Y.; and JAMES L. AUSTIN, Carborundum Co., Niagara Falls, N. Y.

Student Branch

The best program of speakers and the best attendance have combined to make the past year the most successful in the history of the Student Branch at the New York State College of Ceramics, Alfred, N. Y.

About 135 students were present at the last meeting to take part in the election of officers for 1942–1943, and the competition for the various positions was exceedingly keen. FRANCIS J. DILAURA was elected *President;* WILFRED CLAY, *Vice-President;* GUY E. RINDONE, *Treasurer;* and ROBERT R. SINCLAIR, *Secretary.*

The following officers were also elected for the *Alfred Engineer,* the student trade paper: WALTER EAST, *Editor,* and ARTHUR L. POWELL, *Business Manager.*

The Student Branch is looking forward to another enthusiastic and successful year.

New Salary Scale

A five-year campaign by the administration of the New York State College of Ceramics to establish a higher salary scale for the institution has been concluded successfully. Governor Herbert H. Lehman has signed the bill which the legislature recently enacted which provides for substantial increases in salaries for the College staff. Some salaries which were formerly $2100 will be increased rapidly to a minimum of $2500 and a maximum of $3500. Former salaries of $2500 will be increased rapidly to a minimum of $3500 and a maximum of $4500; salaries which are at present $3000 (heads of the Departments) will be rapidly increased to a minimum of $5000 and a maximum of $6000. Present salaries of $6000 will be increased to a maximum of $7500.

The administration was aided in this campaign by the local legislators, particularly assemblyman William McKenzie, and by alumni of the College and by the Board of Directors of the Ceramic Association of New York.

Ohio State University Student Branch

Group includes graduate students, seniors, juniors, and sophomores. The following professors in the Department of Ceramic Engineering appear in the second row: J. L. Carruthers (far left), R. M. King (third from right), and A. S. Watts (far right).

OHIO STATE UNIVERSITY

Student Branch

The May meeting of the Ohio State University Student Branch was held on May 8 in Lord Hall.

Wilber Stout, State Geologist, gave an interesting talk on "Blast-Furnace Refractories and Points of Interest to Ceramic Engineers."

1942 Graduates

Bachelor of Science in Ceramic Engineering: MORRIS BERG, Aviation Ground School; GEORGE E. BROWNEWELL, commissioned officer, R.O.T.C.; ALBERT J. CATON, Basic Magnesium, Inc., Reno, Nev.; PAUL S. KING, commissioned officer, R.O.T.C.; WILLIAM R. PATTON, Robinson Clay Product Co., Dover, Ohio; ROBERT L. REED, Carnegie-Illinois Steel Corp., Chicago, Ill.; JAMES H. RICKEY, commissioned officer, R.O.T.C.; RALPH ROSE, commissioned officer, R.O.T.C.; ROBERTO G. SADA, Homer Laughlin China Co., Newell, W. Va.; THOMAS S. SHEVLIN, commissioned officer, R.O.T.C.; ROBERT H. THOMAS, graduate school, Ohio State University. Summer graduates: DUDLEY P. FRAME, JR., commissioned officer, R.O.T.C., and ARCHIE SHICKLE, undecided.

—D. E. HOLMGREN, *Corresponding Secretary*

GREAVES-WALKER NONMETALS CHIEF

A. F. Greaves-Walker, head of the Department of Ceramic Engineering, University of North Carolina, Raleigh, N. C., has been appointed chief of the Nonmetals Section of the War Production Board. He reported in Washington, D. C., on June 10.

During World War I, Professor Greaves-Walker served as chief of the Industrial Furnace Section of the U. S. Fuel Administration and also as a consultant on nonmetallics to the War Industries Board.

He has been granted a leave of absence from the University, and R. L. Stone, professor in the Department, will be acting head during his absence.

MINERALS IN WAR EMERGENCY

Discussion presented by Richard J. Lund, Chief, Miscellaneous Minerals Branch, War Production Board, Washington, D. C., during the General Sessions on War Emergency Problems held at the Forty-Fourth Annual Meeting, The American Ceramic Society, Inc., April 20, 1942.

Dr. Purdy asked me to say a few words about the work of the War Production Board in connection with some of the minerals with which you are concerned. I will illustrate our general line of work by citing what we have done in connection with the kyanite problem.

Last summer, when the shipping situation began to show signs of tightening up, our attention was called to the fact that some of the importers were having difficulties in obtaining shipping space for Indian kyanite. We promptly checked into the suitability of domestic material as a substitute, but there was some disagreement on this. Shortly thereafter we called a meeting which was attended by present representatives of kyanite producers and consumers and by a sizable number of government agencies interested in the problem, including the U. S. Bureau of Mines and the National Bureau of Standards. It was the consensus of that meeting that considerable work remained to be done before a specific answer could be given as to just how well domestic material could substitute for Indian kyanite in the manufacture of superduty refractories.

As a result of that meeting, the Bureau of Mines intensified the work it had been doing for some time on this general problem. At the same time, the Advisory Committee on Metals and Minerals of the National Academy of Sciences was asked to report on the conservation and substitution of Indian kyanite, stressing the kinds of refractory shapes and brick on the market at the present time that could serve as substitutes and also indicating roughly the loss in efficiency that might result from their use. Russell P. Heuer of the General Refractories Co., Philadelphia, Pa., headed the subcommittee on nonmetals which handled this report. The Bureau of Mines, on the other hand, carried the main job of investigating domestic materials, such as domestic kyanite itself and domestic topaz, as substitute raw materials. At that time, domestic topaz appeared to be one of the best bets. Not much detailed work had been done in surveying the deposit in South Carolina, and, inasmuch as it was important to know how long the reserves there would last before plans were made for its development as a large-scale substitute, the Geological Survey was asked to report on the deposit. This they did promptly, and they concluded that there was enough topaz there for at least several years.

The Bureau of Mines continued its studies, and industry itself conducted tests on the suitability of topaz; indications pointed more and more to the fact that topaz would give us the best substitute material. No large-scale test, however, had been made. Most of the testing had been done in laboratories on a relatively small scale. One of the most difficult problems involved in the utilization of topaz is in drying out the fluorine to a sufficiently low content to permit its fabrication into refractories without danger to equipment and personnel. It was well known that the lump material from the mine could be calcined in a periodic kiln and the fluorine lowered to the necessary degree; but considerable amounts of the topaz are intermixed with quartz and require grinding to effect a suitable separation. The relatively fine material would have to be calcined in a rotary kiln. With the help of the Bureau of Mines, it was found that a large kiln was available at the Wilson Dam of the Tennessee Valley Authority for such a large-scale test, and after some unavoidable delay an agreement was made whereby TVA would conduct such a thorough test.

This test, completed only a few weeks ago, will be discussed in the following paper by B. C. Burgess. The calcined material is just now being tested thoroughly by a number of refractories manufacturers. We have high hopes that the material will form an acceptable substitute.

In the meantime, late in 1941, Indian kyanite was placed under Order M-63, by which we exercise close control over the importing of this material. To build up stocks to serve as a reserve until domestic substitutes can be brought into the picture, we are following the policy of allowing only 50% of the material now being imported to go into essential war uses; the other 50% must be held in reserve as a stockpile for disposition only under authorization by the War Production Board. We have also recommended to Metals Reserve that they purchase some of this themselves, as a future reserve until substitutes are developed to a satisfactory point.

You now have a thumbnail sketch of the interest we in the War Production Board are taking in this problem. In the Miscellaneous Minerals Branch, we are handling a number of the other raw materials in which ceramic men are interested. Fortunately, few of them, e.g., clays, kaolin, and feldspar, involve any serious difficulties at the present time as far as adequate supplies are concerned. A lot of attention is being given to certain types of talc which are used in the manufacture of steatite for high-frequency porcelain insulators; more recently, new uses for lithium indicate that we must expand production of the spodumene that is the raw material supply of this metal and its salts.

Rexford Newcomb, Jr., in his paper entitled "Ceramic Production in Time of War" has stated that uranium is still plentiful. This is perfectly true at the present time, but again there are new uses under consideration which might overnight change that situation materially. At present, there is an adequate supply of feldspar, but by chance we have just heard of a new use for feldspar that is under consideration which might also change that situation.

This, very briefly, is the type of work we are carrying on in the Miscellaneous Minerals Branch. It is likely that in the near future we will have to expand our staff handling these materials much further.

TOPAZ DEVELOPMENT AS A SOURCE OF ALUMINA*

By B. C. Burgess

Abstract

The new development of a commercial topaz deposit is discussed. The deposit and production of the first 1180 tons is described briefly. Analyses and methods of fluorine determination are given. Reserves, calculated in the Fries' report as 56,900 tons, are adjusted by the determination of topaz in waste to 130,000 tons; the topaz found in three areas may amount to 260,000 tons. The size classification of recoverable topaz is estimated; 79% is $+^1/_4$-in. and is suitable for calcining. Calcination experiments were first made in a brick kiln, then in a cupola kiln built for the purpose. Satisfactory results have been obtained in a periodic kiln at 2700°F. The disposal of toxic fluorine gases presents a problem. The Tennessee Valley Authority is conducting tests in a rotary kiln at 2600° to 2960°F. The essential features of mining, calcining, and fluorine recovery have been determined and set forth in flowsheets. Forty per cent of Indian kyanite is being used in the glass industry, 50% for metallurgical purposes, and 10% for miscellaneous purposes. Specific uses are listed in each of these divisions, and several substitutions of topaz refractories are mentioned; those in the glass industry already show satisfactory results. Calcined topaz is closer to the composition of mullite ($3Al_2O_3 \cdot 2SiO_2$) than calcined Indian kyanite or any other domestic product, and it has satisfactory physical properties. The supply of raw material is adequate, and satisfactory methods of production and calcination have been developed.

I. Introduction

"The stone which the builders rejected, the same has become the head of the corner" (Matthew XXI, 42). Perhaps the South Carolina gold miners were more destructive than constructive, but the gold they mined has been buried again (in Kentucky), and the topaz which they threw away has become a strategic victory mineral.

II. History

Rejected with other waste for over one hundred years, topaz was suspected by Graton[1] in 1906 and was finally identified by Pardee[2] in 1935. The development of topaz as a commercial mineral has been discussed by Glass[3] and by Bradley, Schroeder, and Keller.[4]

This is the story of the topaz now being produced at the old Brewer Gold Mine near Jefferson, S. C. (see map, Fig.

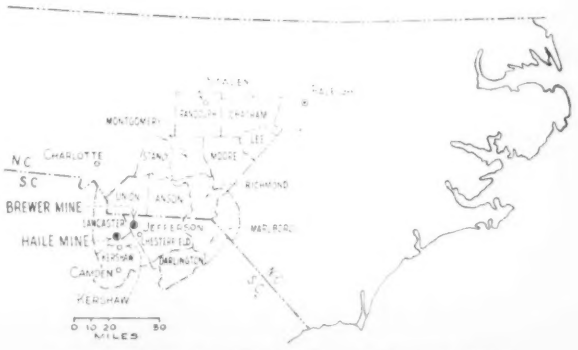


Fig. 1.—Map showing location of Brewer Mine.

Fig. 2.—Stock pile of crude topaz.

* Presented at the Forty-Fourth Annual Meeting, The American Ceramic Society, Cincinnati, Ohio, April 21, 1942 (General Sessions on War Emergency Problems). Received May 4, 1942.

[1] L. C. Graton, "Reconnaissance of Some Gold and Tin Deposits of the Southern Appalachians," *U. S. Geol. Surv. Bull.*, No. 293, 134 pp. (1906); pp. 90 and 91.

[2] J. T. Pardee, J. J. Glass, and R. E. Stevens, "Massive Low-Fluorine Topaz from Brewer Mine, S. C.," *Amer. Mineralogist*, **22** [10] 1058–64 (1937).

[3] J. J. Glass, "Extraordinary Topaz: Replacement Body in Brewer Mine, S. C.," *Trans. Amer. Geophys. Union*, **18** (1937).

[4] R. S. Bradley, F. W. Schroeder, and W. D. Keller, "Study of Refractory Properties of Topaz," *Jour. Amer. Ceram. Soc.*, **23** [9] 265–70 (1940).

1). Stuckey and Amero,[5] Burgess,[6] and Fries[7] have described its occurrence.

III. Description

Massive cryptocrystalline topaz is found in a large quartz-sulfide body which has replaced the ancient metamorphic rocks of the Carolina slate belt (see Fig. 2). Float topaz is prevalent in three areas which total twenty acres in surface extent. Gold-mining operations have exposed topaz replacement bodies of irregular size and shape extending from the surface, northwest of the Brewer pit, down through the north tunnel for approximately 150 ft. There is no evidence of a bottom at this depth.

IV. Mining

Five hundred and eighty tons of float topaz and 600 tons of vein topaz have been mined to date (March 31, 1942) by the simplest possible methods. One hundred and eleven tons of float topaz were picked up on the surface of one 5-acre area. The remainder of the float topaz was dug from the first 12 in. of soil in the same area. All of the vein topaz has been obtained by sinking on the outcrop and following the irregular bodies of topaz. In this way, a surface area of about 50 by 100 ft. has been opened, and a maximum depth of only 15 ft. has been obtained. Drilling has been done with jackhammer-type drills. No serious problems have been encountered because of the hardness of the topaz.

Considerable cobbing has been necessary to free the topaz from adhering quartz. This problem, however, is of minor importance. Old gold workings gophering under the present surface topaz mining area show that most of the topaz is in a friable type of quartz which crumbles on exposure to air and breaks cleanly from the topaz. Topaz occurs in a similar type of quartz in the north tunnel, but it is somewhat harder at the 150-ft. depth than near the surface.

V. Analysis

There has been a gratifying improvement in the quality (F_2 content) of the topaz, in spite of the comparatively brief experience of the crew in mining and sorting. The first carload of float topaz gave a fluorine determination of 12.74%. Early shipments of the vein material contained 13.35% of fluorine; recent shipments, however, have contained as much as 14.10%. Analyses are given in Table I.

Fluorine Determination

There are two routine methods for the determination of fluorine, namely, (1) a colorimetric method which is based on the bleaching action of fluorine on the yellow color of a solution of titanium oxidized with hydrogen peroxide; this method is used for materials containing less than 1.5% of fluorine. (2) The SiO_2 is separated by repeated additions of zinc oxide reagents, the fluorine is separated as PbClF, the chlorine from this compound is precipitated with an excess of standard $AgNO_3$ solution, and the excess $AgNO_3$ is determined by means of a standard solution of potassium thiocyanate[8] (used for materials containing more than 1.5% of fluorine).

TABLE I

ANALYSES OF BREWER MINE TOPAZ

Description	Loss	SiO_2	Al_2O_3	Fe_2O_3	F_2	Subtotal	Less (0 = 2F)	Total
Float material (first car shipped)	N. D.	40.20	50.28	0.92	12.74	104.14	5.37	98.77
Float material ground to 200-mesh at Staley (first lot)	1.51	42.80	48.62	.98	11.93	105.84	5.03	100.81
Float material (10 tons) ground to 200-mesh at Staley (second lot)	1.24	39.60	51.30	.70	12.65	105.49	5.33	100.16
Heavy gray vein material	1.08	39.30	52.34	.16	12.73	105.61	5.37	100.24
Shipments of vein topaz (Oct., 1941)	N. D.	40.20	51.79	.21	13.35	105.55	5.63	99.92
Float material (sample sent to N. C. State College)	"	32.70	57.80	.75	14.20	100.45	5.98	99.47
Float material (calcined by N. C. State College)	"	29.85	69.22	.82	0.12	100.01	0.05	99.96
Float material (calcined by Minpro Laboratory)	"	28.90	71.06	0.22	0.15	100.33	0.06	100.27
Float material (30 tons) partially calcined at Pontiac, S.C.	"	42.50	53.29	1.01	5.28	102.08	2.21	99.87
15 tons of vein topaz (to Sheffield for calcining)	0.88	37.20	53.25	0.35	14.10	105.78	5.90	99.88
Calcined vein topaz (Sheffield (T-18))	N.D.	32.50	67.30		0.31	100.11	0.12	99.99

VI. Reserves

Except for the relatively small amount of topaz occurring with kyanite in India (and with the exception of gem topaz, which is quite a different occurrence), this mineral has never been mined. There are therefore no criteria, and any estimate of reserves must be considered to be prospec-

[5] J. L. Stuckey and J. J. Amero, "Physical Properties of Massive Topaz," *Jour. Amer. Ceram. Soc.*, **24** [3] 89–92 (1941).

[6] B. C. Burgess, "Topaz, a New Industrial Mineral," *Eng. Mining Jour.*, **142** [9] 57–58 (1941); *Ceram. Abs.*, **21** [1] 25 (1942).

[7] Carl Fries, Jr., U. S. Geological Survey abstract release dated Oct. 31, 1941.

[8] J. I. Hoffman and G. E. F. Lundell, "Determination of Fluorine and of Silica in Glasses and Enamels Containing Fluorine," *Bur. Stand. Jour. Research*, **3** [4] 581–95 (1929); *Ceram. Abs.*, **9** [1] 64 (1930).

tive until it is actually proved by mine development.

Shortly after the mining of the vein topaz was begun, the U. S. Geological Survey asked Carl Fries, Jr., to estimate the quantity of topaz available.[7] According to his estimate, the following quantities of topaz are available:

Placers (float)	
$+^1/_4$-in.	8700 tons of topaz
$-^1/_4$-in.	3200 " " "
Outcrop area (vein)	
First 50 ft. (106,000 tons at 15%)	16,000 tons of topaz
50 to 180 ft. (194,800 " " ")	29,000 " " "
Total	56,900 " " "

A 1200-lb. sample, carefully taken from approximately 3000 tons of waste derived from mining 600 tons of vein topaz, gave heavy liquid tests as follows:*

	Weight (%)			Percentage + 10-mesh topaz
	Percentage of size	Percentage of total	Specific gravity	
Head		100.00		
-1-in. to $+^1/_4$-in. head	100.00	29.50		
-1-in. to $+^1/_4$-in. sink in 2.95	70.89	20.91	3.48	20.91
-1-in. to $+^1/_4$-in. float in 2.95	29.11	8.59	2.77	
$-^1/_4$-in. to +10-mesh head	100.00	15.35		
$-^1/_4$-in. to +10-mesh sink in 2.95	56.35	8.65	3.45	8.65
$-^1/_4$-in. to +10-mesh float in 2.95	43.65	6.70	2.79	
Primary (10-mesh)		44.72	2.99	
Secondary (10-mesh)		10.43		
				29.56

* Letter from S. A. Falconer, American Cyanamid Co., to B. C. Burgess dated March 13, 1942 (preliminary report of test of 1200-lb. sample).

The preceding table shows 29.56% of topaz in the waste from the present mining. The following results are obtained when this correction is applied to the Fries estimate:

	(Tons)
Placers	11,900
Vein topaz	
First 50 ft. (106,000 at 15%)	15,900
+ (29% of 85%) 106,000	26,100
50 to 180 ft. (194,800 at 15%)	29,200
+ (29% of 85%) 194,800	48,000
Total possible topaz	129,900

This revised estimate is for only one of the three areas of float topaz. No estimate has been made of the other two areas; it is possible that in the three areas the total reserves of topaz might be double the amount of this revised estimate, or approximately 260,000 tons.

The size of recoverable topaz from mining and from test work to date indicates the following range:

	Percentage of total	Percentage of estimated reserves
+1-in. to 6-in. (occasional pieces larger)	27	37
-1-in. to $+^1/_4$-in.	31	42
$-^1/_4$-in. to +10-mesh	15	21
-10-mesh (not included in estimated reserves)	27	
Total	100	100

Thirty-seven percent of the estimated reserves is in topaz (+ 1-in.) suitable for hand sorting and 79% (+ $^1/_4$-in.) is suitable for calcining.

VII. Calcination

The first attempt to calcine this topaz was made in a periodic brick kiln with a top temperature of about 2400°F. After some trouble with draft, a partially calcined product was obtained (see Pontiac sample, Table I).

A small cupola kiln, built for the purpose, also failed because the silica "foam" cut off the draft (see Fig. 3).

Satisfactory calcining results were obtained in a rectangular downdraft periodic kiln at 2700°F.

In March, 1942, the Tennessee Valley Authority completed a test of a 15-ton lot in a continuous rotary kiln.

Pole[9] summarizes the test as follows:

Calcining experiments in a 20-in. inside diameter, 25-ft. rotary kiln were carried out on a 15-ton shipment of -1-in. topaz ore. The investigation covered the operation of the rotary kiln at temperatures from 2600° to 2950°F. and feed rates from 200 to 400 lb./hr., with retention of the feed in the kiln from 70 to 120 min. The chemical composition, screen analyses, and apparent porosity of the feed and calcined product were determined. The most favorable operating conditions for the small rotary kiln were judged to be a temperature of 2700°F., with a feed rate of 300 lb./hr. at a kiln rotation of 0.90 r.p.m. Products made under these conditions had an average fluorine content of 0.24% and an apparent porosity of about 19%. The calcination treatment caused a dust loss of about 11%. Screen analyses showed that no serious reduction in particle size caused by heat-treatment took place.

Pole's report closes with the following discussion and conclusions:

Based on the 48-hr. test under the optimum conditions determined from this investigation, it was concluded that the rotary kiln offered a practicable means of calcining and defluorinating raw topaz. Defluorination to less than 0.5% could be effected by a calcination procedure that could be maintained without difficulty, and there appeared to be no problem with respect to kiln corrosion or other unusual deterioration of equipment. The feed showed no pronounced tendency to stick or ball up in the kiln. The dust losses (about 11%) are believed to be considerably higher than would be experienced in full-scale operation,

[9] G. R. Pole, "Calcination of Topaz Ore" (report of tests), April 15, 1942.

FIG. 3.—Cupola kiln for calcining topaz.

because the ratio of the cross-sectional area of the kiln to the cross-sectional area of the feed in the kiln would be considerably greater in a larger kiln. This increase would result in a lower velocity through the kiln for the fuel combustion products, with consequent reduction in dust loss. Operation on a larger scale would result also in a lower fuel consumption per ton of product. The screen analyses of the −1-in. raw topaz and product also showed that the larger screen fractions (1- to $^1/_2$-in.) were affected most by the calcining treatment with respect to reduction in particle size.

Judged by the physical and chemical tests made, the product appears to be well-suited to the fabrication of high-grade mullite-type refractories. The apparent porosity of the product is considerably greater than that of Indian kyanite (19 to 20% as compared to 14.6%, respectively). Commercial grades of high-alumina made from diaspore and from bonded synthetic mullite, however, have porosities varying from 20 to 30%, and a larger number of the best grades of bonded or wet-case refractories used as flux blocks for glassmaking furnaces have apparent porosities of 20 to 25%. It is felt, therefore, that the higher porosities of the calcined topaz as compared to that of Indian kyanite are no serious detriment. The tests showed that a product with an Al_2O_3 content of as high as 67 to 70% could be produced. This compares with an Al_2O_3 content of 63 to 65% and 57 to 60% for Indian kyanite and high-grade domestic kyanite, respectively. The higher alumina content of the calcined topaz should be an advantage from the standpoint of its uses as a refractory, since it approaches closer to the composition of mullite ($3Al_2O_3 \cdot 2SiO_2$), which has an Al_2O_3 content of 71.8%. The small amounts of fluorine remaining in the calcined product might actually be beneficial as a mineralizer in promoting "mullitization" when the topaz is mixed with other bonding materials, such as clays, for use as refractories.

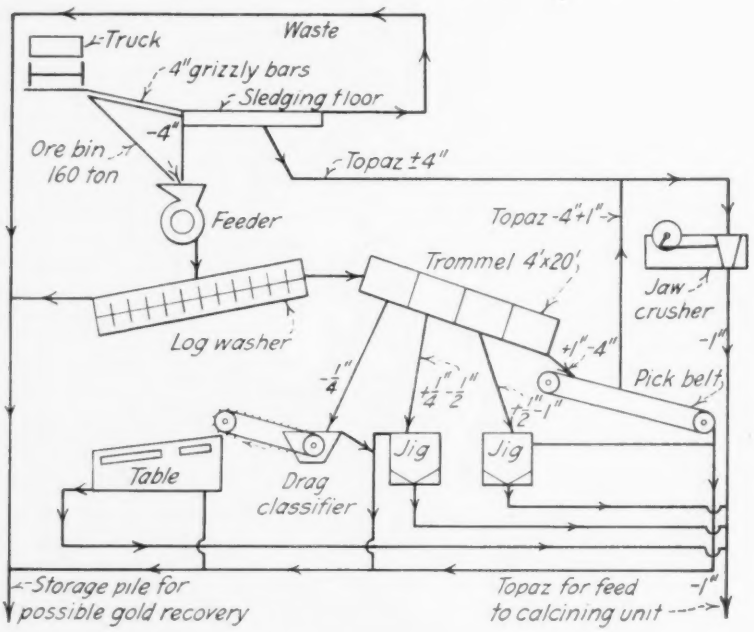


FIG. 4.—Proposed flowsheet of a topaz recovery plant for Brewer Mine; capacity, 20 tons per hr. feed, or 3 to 4 tons of topaz per hr.

VIII. Mining Plant

As a result of laboratory and field tests, a proposed flowsheet of a mining plant has been developed (Fig. 4), which has the following features: mechanical loading, trucks from mine to washer, grizzly bars and bins, a log washer, a trommel for screening, a pick belt and crusher, jigs or sink float equipment, a drag classifier, tables, topaz products, −1-in. to $+^1/_4$-in. to calcining unit, $-^1/_4$-in. to raw topaz storage, coarse and fine tailings for gold recovery, and slimes (wasted).

IX. Calcining Plant

The reaction which takes place when topaz is calcined may be represented as follows:

$$\underset{\text{(Topaz)}}{3(AlF)_2 \cdot SiO_4} + \underset{\text{(Water)}}{H_2O} = \underset{\text{(Mullite)}}{3Al_2O_3 \cdot 2SiO_2} + \underset{\text{(Gases)}}{4SiF_4 + 2HF}$$

Mol. wt.	552	18	426	104 40
	96.8%	3.2%	74.8%	25.2%

The water required for this reaction may be supplied by the products of combustion of the fuel. Commercial topaz is not the pure mineral represented in the preceding equation. Some of the fluorine may be replaced by OH. The commercial product contains some free quartz, which forms a "foam" in the early stages of calcination.

The problems encountered in calcining topaz have been (1) to determine optimum temperature-time relations; (2) to avoid draft interference from the silica "foam" evolved; and (3) to dispose of or to collect the toxic gases evolved.

The necessary information has been obtained from tests and from corresponding procedure in handling similar chemical products. A flowsheet (Fig. 5) has been proposed for calcining the topaz and for the recovery of sodium silicofluoride as a by-product. It consists of a topaz feed (−1-in. to $+^1/_4$-in.), a rotary kiln, a rotary cooler (calcined topaz product), a recuperator, a scrubber, a storage tank for H_2SiF_6, a precipitation tank (with NaCl), a filter, and a rotary drier (sodium silicofluoride product).

X. Uses

It is estimated that the use of Indian kyanite refractories is distributed as follows: for the glass industry 40, metallurgical uses 50, and miscellaneous uses 10%.

In Glass

Indian kyanite refractories are used in continuous glass tanks above the molten glass line. (Refractories below the glass line are called flux blocks. Few kyanite flux blocks are made.)

Indian kyanite refractories are also used in the mantle above the batch feeder, as tuck stones in the melting end, as breast walls in the hot end, for parts, and in other "difficult" spots such as forehearths, feeder parts, rings, plungers, and tubes.

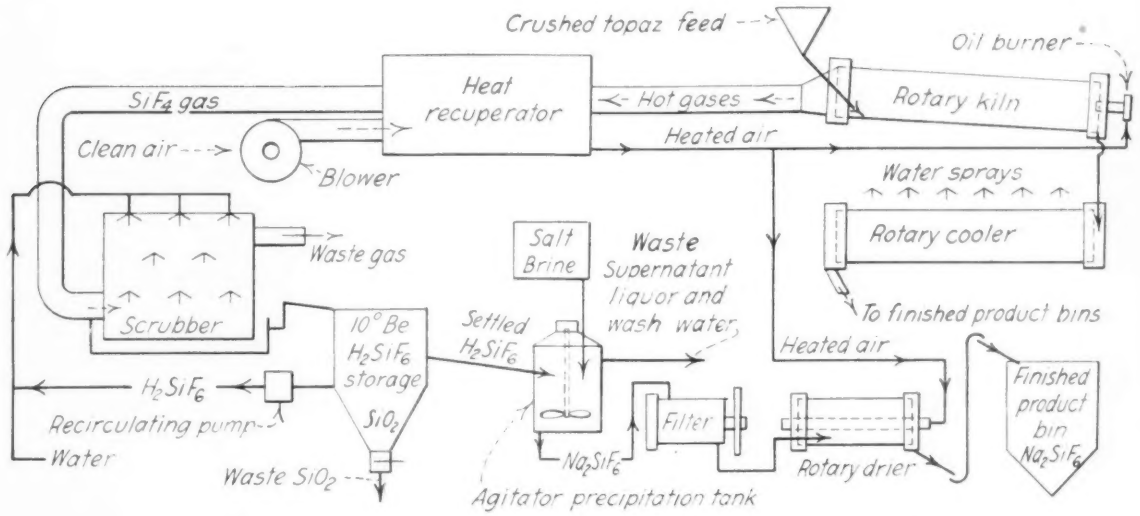


FIG. 5.—Proposed flowsheet for calcination of topaz and for the production of Na_2SiF_6.

Metallurgical Uses

Indian kyanite refractories are used chiefly in electric furnaces, such as the Ajax-Wyatt induction furnace for brass melting. They are also used in the linings of indirect-arc steelmelting furnaces, in high-frequency induction furnaces, in burner ports, electric-furnace door jambs and arches, in crucible and open-flame melting furnaces, and in burner tunnels for heat-treating furnaces.

Miscellaneous Uses

Indian kyanite refractories are used in ceramic kilns, particularly in pillers and flues where good load-bearing at high temperatures is required. They are also used for kiln furniture and for high-temperature laboratory test kilns. Nonceramic uses probably account for half of the miscellaneous uses. The shapes are practically all special and are generally hand made. The negligible volume change and the spalling resistance of Indian kyanite refractories are important.

Refractories made from topaz are being used in the glass industry and are already showing encouraging results. Topaz brick are also being tested for use in malleable furnace sidewalls and bottoms, piers of heat-treating furnaces, burner blocks in high-temperature furnaces, open-hearth checkers, roofs of electric steelmelting furnaces, vertical lime kilns, petroleum coking furnaces, gray iron cupolas, frit furnaces, boiler sidewalls, and in welding and forging furnaces.

XI. Patents

Freed[10] anticipated the use of topaz in superrefractory bodies. His patent is assigned to the Secretary of Commerce as trustee for the government and for the people of the United States, and it may be used by any person in the United States without the payment of royalty.

[10] M. L. Freed, "Composition of Matter, a Superrefractory Body Formed Therefrom, and Process of Manufacturing Same," U. S. Pat. 644,244, Oct. 4, 1927; *Ceram. Abs.*, **6** [12] 591 (1927).

XII. Conclusions

Calcined topaz approaches the composition of mullite ($3Al_2O_3 \cdot 2SiO_2$) closer than calcined Indian kyanite or any other domestic product. It has satisfactory physical properties. The supply of raw material is considered to be adequate, and satisfactory methods of producing and calcining have been developed. The war emergency may result in the discovery of a domestic material equal or superior to anything previously imported, the commercial production of which will continue far beyond the war period.

Acknowledgment

The author appreciates the assistance of J. E. Boyd, Jr., J. H. Weis, and S. Guy Wiseman, all members of the Minpro staff, in the preparation of this paper.

UNITED FELDSPAR & MINERALS CORPORATION
SPRUCE PINE, NORTH CAROLINA

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(1) Memorandum from R. P. Heuer, General Refractories Co., Philadelphia, Pa., to Clyde E. Williams, Battelle Memorial Institute, Columbus, Ohio, "Substitutes for Refractories Made from Indian Kyanite," Oct. 31, 1941.

(2) H. L. Cook, "Enamel Shop Operation under Present Restrictions on Materials," *Ceram. Ind.*, **38** [3] 54, 56 (1942).

(3) P. F. Kerr, "Sillimanite Group: Andalusite, Kyanite, Sillimanite, and Dumortierite," chapter II. Industrial Minerals and Rocks, A.I.M.M.E., 1937.

KYANITE IN GRAVES MOUNTAIN, GEORGIA*

By Joel H. Watkins

Abstract

The geology of Graves Mountain and the composition of the kyanite present are discussed. This deposit is rich and workable, and commercial production could be accomplished quickly.

I. Introduction

For a number of years, Graves Mountain, Georgia, has been looked on by mineralogists as classic ground. It was owned for more than forty years by the late George Frederick Kunz of Tiffany & Company, and many museums contain fine specimens of crystalline rutile as well as deep blue crystals of lazulite in snow-white quartzite from this locality. Although published references to Graves Mountain have usually mentioned the presence of kyanite in the quartzite, Graves Mountain seems to have been overlooked in the recent search for workable deposits of kyanite in this country. This oversight may be due in part to the fact that the kyanite in Graves Mountain has little color and looks somewhat like the quartzite itself. It does not occur in large, showy blue crystals like the deposits at Clarkesville, Georgia; Celo Mines, North Carolina; and Bakers Mountain, Virginia.

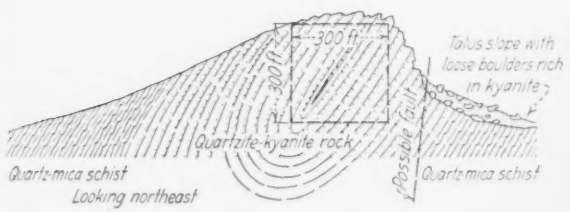

Fig. 1.—Section through Graves Mountain showing probable structure.

II. Geographic Position and Geology

Graves Mountain, which is on the southern edge of Lincoln County, Georgia, is an isolated monadnock, about 3000 ft. in length, standing like a hog's back about 350 ft. above the surrounding country. It is near the eastern edge of the Piedmont Plateau and about 40 miles west of Augusta.

Geologically, this mountain is made up entirely of Cambrian quartzite in the form of a steeply overturned synclinal trough. The contact rock surrounding the mountain is a fine-grained quartz-mica schist, which is probably also Cambrian. As indicated by Fig. 1, there may be a normal vertical fault near the base of the southeast slope of Graves Mountain, but there is no visible proof of the existence of such a fault.

The mountain has a general northeast-southwest trend, with gentle slopes to the northwest and a steep slope to the southeast. At one point on the northwest slope near the top of the mountain, a small amount of surface trenching has been done in the search for rutile crystals. These crystals, which are often nearly perfect, seem to occur in a narrow zone of highly ferruginous material. The rutile crystals, often an inch or more in diameter, are not plentiful, and the occurrence does not have the aspect of becoming a commercial source of rutile. Beautiful deep-blue crystals of lazulite up to $^1/_2$ in. in diameter occur in narrow bands in snow-white quartzite at several points in the mountain. The lazulite, an iron aluminum phosphate, has no known commercial use, but when carefully broken, it makes fine cabinet specimens. A small amount of pyrophyllite is present throughout the

Fig. 2.—Southeast face of Graves Mountain showing 100-ft. face of quartzite-kyanite rock.

* Presented at the Forty-Fourth Annual Meeting, The American Ceramic Society, Cincinnati, Ohio, April 23, 1942 (Materials and Equipment Division). Received March 12, 1942.

quartzite, and masses of radiating white crystals of pyrophyllite weighing up to 25 lb. or more may be picked up on the surface.

In May, 1940, the present owners drove a tunnel into the southeast slope of the mountain for a distance of about 75 ft. to obtain fresh unweathered rock for flotation tests. The fresh rock showed small amounts of pyrite as was expected.

FIG. 3.—Graves Mountain quartzite-kyanite showing rough texture of kyanite where sand has been weathered out.

III. Flotation Tests

During the summer of 1940, rather exhaustive flotation tests on a 300-lb. sample of the kyanite-quartzite rock taken from the prospect tunnel were carried out by the American Cyanamid Company at their Stamford, Connecticut, ore-testing laboratory. These tests show conclusively that the pyrite, pyrophyllite, and quartzite can be separated readily and cheaply, yielding a −40-mesh kyanite concentrate which contains 96 to 97% of kyanite with a very low iron content. Preliminary sampling indicates that the quartzite contains about 30% of kyanite by weight and that the yield will be about 1 ton of concentrates for 4 tons of material milled.

An important factor in connection with the physical properties of the Graves Mountain kyanite-quartzite is that the quartzite, when disintegrated, yields a fine sand, all of which will pass a 50-mesh screen. After passing through rolls, a large percentage of this sand is liberated and will drop freely through a 50-mesh screen, permitting most of the kyanite to pass over. This roughing, at little additional cost, would increase the kyanite content of the flotation mill feed to at least 60%.

IV. Availability

Figure 2 shows the steep face on the south side of Graves Mountain, and the rough texture of the exposed kyanite crystals where the fine sand has weathered out is shown in Fig. 3. A quarry can be quickly opened on this side of the mountain with a face of 100 ft. or more in height, and no stripping, hoisting, or pumping would be required. The initial mill would have about 100 ft. or more fall over the talus slope, which would afford a considerable saving in elevators.

Graves Mountain is about 350 ft. high and 350 ft. wide at the top. Although the full length of the mountain is more than 3000 ft., 1500 ft. of this length probably represents the highest part of the mountain and the best stone. A block of this quartzite, 300 ft. high, 300 ft. wide, and 1500 ft. in length, would weigh ten million tons and should yield not less than 2,500,000 tons of kyanite concentrates.

Since India's source of kyanite has been cut off, kyanite has been classed as one of the "scarce minerals." It has been placed, more recently, in the group of thirteen strategic minerals for which this country has been more or less dependent upon foreign countries.

As it stands today, undeveloped and unchallenged, Graves Mountain represents one of the largest, richest, and most workable deposits of kyanite in North America and one which, in an emergency, can be brought quickly into production.

CHARLOTTE COURT HOUSE, VIRGINIA

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POSSIBILITIES OF MASONRY ENGINEERING*

By Frederick Heath, Jr.

Abstract

Suggestions are given for ten possible improvements in wall construction, namely, (1) 1942, brick wall insulated; (2) 1943, modular brick wall insulated; (3) 1944, add cavity; (4) 1945, add cooling; (5) 1946, add air conditioning; (6) 1947, add panel heating; (7) 1948, add structural clay tile; (8) 1949, add reinforcing; (9) 1950, add prefabrication; and (10) 1951, add solar heating.

Introduction

The purpose of this paper is to look ahead toward a few possibilities for structural clay products. The Aluminum Company of America has coined the word "imagineering" for this interesting pastime. Other metal producers are encouraging this type of thinking for the markets which they hope to develop for their materials when these materials are no longer essential for war needs.

Special emphasis is placed on the possibilities in New England where soft-mud common brick is at present almost the only structural clay product produced. Some stiff-mud brick is made, but no tile.

The suggestions made involve the first phase of imagineering, and it must be understood that they may not stand the test of more thorough research and engineering. The writer has arranged these ten suggestions in a sequence of ten years to indicate the relative time that may be required to examine them or reduce them to practice. Many persons may disagree with the relative importance of the sequence, if not with the whole idea of prognostication. Our country is in this war to defend that privilege among our other cherished freedoms.

1942, Brick Wall Insulated

In this fast-moving year of 1942, the building industry has already faced adjustments in planning to conserve critical metals, e.g., the limitation of furnace sizes in house construction. To heat houses properly, particularly in northern climates, the use of insulation and other heat-conservation measures must be investigated. However little may be needed to meet the requirements of the War Production Board, investigation indicates that the added first cost of reasonable heat-conservation measures pays a worth-while dividend to the owner in reduced heating expense.

This same sales argument applies to the added first cost of brick for a house, inasmuch as brick saves substantial expense to the owner in painting, maintenance, insurance, and depreciation. Studies made in 1937 indicate that 2 in. of insulation in the furring space of a brick wall result in fuel savings amounting to 86.7% annual return on the cost.[1]

Parkchester, the largest housing project in the world, which was recently completed for the Metropolitan Life Insurance Company in the Bronx, New York, has solid brick walls with glass wool insulation. The owners estimate that this insulation saves $40,000 annually in fuel costs.

This is not a new or unproved construction. It has come into use very rapidly since 1937 when insulation was made available with a vapor seal to prevent condensation from the moisture-laden heated atmosphere of the rooms. There is sufficient breathing through a brick wall to ventilate the insulation to the exterior and to keep it dry. A well-constructed solid brick wall, 8 in. or thicker, may not always absolutely prevent the passage of a continued driving rain, but the furring space with its insulation and vapor seal prevents any moisture from reaching the plaster. All forms of mineral wool are permanent and cannot be harmed by moisture. The only dry rot that can occur is in untreated wood furring strips. As these strips are not essential to the load-bearing integrity of the wall, there is no structural damage, as frequently happens with brick veneer walls. Metal furring strips were used at Parkchester.

The National Mineral Wool Association, 1270 Sixth Ave., New York City, illustrates this type of wall construction in its magazine *Performance*. A current issue (Vol. 3, No. 4) features insulation studies developed in cooperation with the National Homes Foundation. Village Home No. 4 in 8-in. solid brick is described. It is a two-story, six-room house, 23 ft. 8 in. by 24 ft. 6 in. in size. The calculated annual fuel cost for Zone 7, which includes southern New England, for this house, uninsulated (8-in. brick and 2-in. wood furring), is $156; with $3^5/_8$-in. thick mineral wool in the ceiling and 2-in. thick mineral wool in the furring space, however, the annual fuel bill is $79. It is estimated that this insulation saves $184 on the first cost of the heating plant by reducing by 49% the steam radiation required.

The architectural, engineering, and home magazines probably give more space to advertising and publicity for insulation than for any other building commodity. The public knows about Johns-Manville rock wool, Owens-Corning Fiberglas, and the many other brands.

A new cellular glass is soon to be produced in quantity by one of the largest advertisers. This product, which may be applied without furring and may be either plastered or left as the wall finish, is itself a vapor seal.

There are many other forms of insulation for solid brick walls. The furring can support insulating boards, such as Celotex, for a plaster base. Metal foils are effective, but they are critical materials at present. There are other kinds of blanket- and fill-type insulations in addition to mineral wool (including fire-proofed cotton) that can be

* Presented at the Forty-Fourth Annual Meeting, The American Ceramic Society, Cincinnati, Ohio, April 22, 1942 (Structural Clay Products Division). Received June 6, 1942.

[1] Frederick Heath, Jr., "Brick Walls Insulated." Paper presented at annual meeting of the Brick Manufacturers Association of America, Richmond, Va., January 19, 1937.

applied in the furring space. There is even an insulating plaster composed of expanded vermiculite.

Although 2 in. of insulation may not be so effective as the full thick $3^5/_8$-in. mineral wool, the cost of the additional $1^5/_8$ in. is hardly justified by added uel savings.[1]

The 8-in. or thicker solid brick wall insulated is desirable for summer comfort. Brickwork has a high heat-storage capacity. The scorching midday rays of the summer sun will not pass a brick wall. It may warm the brickwork slightly, but in the cool of the evening the radiation must be outward. The insulation minimizes flow into the house. This added comfort from brick is decidedly noticeable.

This type of wall construction contributes to a high M.R.T. (mean radiant temperature) in winter and a low M.R.T. in summer. These are the conditions which insure comfort.

This combination of insulation with brickwork has many advantages besides comfort and fuel economy. It is time-proof, fireproof, termite- and rodent-proof, and shrink-proof; in fact, it is proof against all elements that cause deterioration of most kinds of wall construction.

For salesmates, brick would have the company of insulation, gas, oil, and gas and oil furnace salesmen, as well as their advertising support. This would have a distinct appeal for building material dealers, most of whom are already actively promoting insulation and are receptive to freedom from dry rot and painting difficulties.

The brick wall insulated merits our promotion in 1942.

1943, Modular Brick Wall Insulated

The automobile has always been a means of transportation, the first of which were neither fast, quiet, comfortable, dependable, beautiful, economical, nor cheap. One of the first improvements made was scientific engineering and standardization of its parts, particularly screws and bolts. The resulting interchangeability, which has paved the way for efficient mass production and lower costs, could not have been accomplished without the National Screw Thread Commission, the work of which has been taken over by the American Standards Association.

The first automobiles had buggy-whip holders, but the industry soon shook itself loose from the shackles of tradition. The industry decided that it wanted to progress, and there has been something new in every yearly model since; the automobile is still, however, a means of transportation. It has built a major industry because each year sees some fundamental engineering advance that reduces costs or gives better performance, until today the public cannot wait until it can own its new model. There will be a great demand for automobiles after the war is over, not because our present cars will be worn out, but because they will be out of style.

This is the theory used in styled brick homes. The architectural possibilities for annual models are unlimited. As part of this scheme, there can be brick-wall developments and progress year by year. Fundamentally, the brick wall will still furnish shelter from the weather and support the roof, but it can yearly become cheaper and better.

The most basic need in reducing costs is the elimination of wasteful cutting and fitting, which is a problem of nearly all building materials. An agency similar to the National Screw Thread Commission has been set up to accomplish coordinated standardization, namely, the American Standards Association Sectional Committee A–62 on Coordination of Dimensions of Building Materials and Equipment.

This Committee uses a modular design based on a 4-in. increment. For conventional brickwork, three courses will space to 8 in., and the 4-in. module will govern the dimensions in a plan. Four-in. coursing may also provide the double economy of a slightly larger unit with the elimination of wasteful cutting. These proposals may be authorized as American Standards by the end of 1942, so that the industry can promote the modular brick wall insulated in 1943.

1944, Add Cavity

Let us assume that the war has now been won and we are out to win the peace. It will be the start of an era of better things for better living. Metal will be begging for uses. The public will not only pay for trimmings and new gadgets on its automobiles, but gear-shifting will have become passé.

Now the cavity may be featured in brick walls. It may have metal tie rods, or it may be a brick header type such as Farren-Wall or Wood's Wall. It will not, however, replace insulation, for the economies of the brick wall insulated will have become too well known. It will be sold to add to summer comfort. It will have vents at the bottom and at the top, which will remain closed during the winter and open in the summer. Air will circulate up the cavity and dissipate some of the sensible heat that may be stored up from the hot sunshine. It may even draw the warm air from the rooms.

1945, Add Cooling

In efforts to market metal products, gadgets will be developed that can be built into the cavity to introduce a water spray on the outer wythe of brickwork. This will be absorbed into the pores of the brick, and the air stream will cause evaporation with its decided cooling effect. This will do much toward reducing the M.R.T. and adding to the summer comfort of the house.

1946, Add Air Conditioning

In summer, it is not the heat but the humidity that causes discomfort. After the 1945 results in reducing M.R.T., these metal gadget makers will discover that the home market has real possibilities. They will have hired engineers who have vision and who see the logic in using the cavity with its water spray as a means for dehumidifying the air to be force-circulated through the house. Too much air cooling is not comfortable, but with evaporation-cooled walls little air cooling is desirable. Brick engineers will collaborate with heating and ventilating engineers to get properly balanced conditions.

1947, Add Panel Heating

In 1947, the metal gadgeteers will turn their effort toward conditioning for winter comfort. Hot-air heating, together with steam and hot-water radiators, had become a

little old-fashioned in 1946. The wrought-iron pipe industry several years ago started panel heating by embedding heating pipes in the mass concrete floors of one-story houses. When this mass of floor was once heated, the effect was quite satisfactory, but it took hours to heat the floor. There was also the problem of keeping the flooring down on this surface. They had tried pipes in the second floor, but had discovered that thermal expansion was a little rough on the structure.

The metal gadgeteers therefore saw their opportunity to develop large copper-faced panels for the walls. This metallic surface contacted a network of copper tubing through which warm water could be circulated in winter, and, if desired, cool water in summer. The high insulating value of the wall with its insulation and cavity made this an extremely efficient heating system. The foresighted Revere Copper & Brass Company was ready for this and swept the market. The sizes were coordinated to American Modular Standards, and mass production kept the cost down. The house could be heated in minutes, and the panels were independent of the structural walls so that there were no expansion problems.

This panel system, together with the forced circulation of cavity-conditioned air, gave both winter and summer home comfort that was a new standard of better living.

1948, Add Structural Clay Tile

The brickmakers, having maintained an orderly system of promoting and marketing brick during these years, had discovered that there was a little left over for research, even after paying their taxes. Their engineer had reached near perfection in the design of brick-wall systems for better living. Masons had forgotten how to cut brick and were holding contests in speed of laying. All kinds of modular gadgets had been developed so that the laying of 2000 brick per day was commonplace. A pair of Irishmen in New Haven had averaged 2692 on a recent house job. They no longer cared how many they laid; they were employed by the year.

What was the next step to reduce costs? Some of the plants had been experimenting with diversified product development. It must be admitted that they were a little concerned about the progress of cinder block. Many of the early blocks had cracked and had showed some disintegration; contractors, however, persisted in the use of this product. So structural clay tile made its debut, and fewer orders were lost to cinder block.

1949, Add Reinforcing

During all this time, research was being continued on reinforced brick and tile masonry. Reinforced brick masonry was common in California, and reinforced modular tile floors were taken for granted in the Middle West and South. One day, that severe earthquake, long predicted by Dr. Leet of the Harvard seismograph station, actually happened in New England. The destruction was terrific. That is when reinforced brick and tile got its start in New England. The codes were immediately revised to reinforce, "or else." There was no hesitancy, because reinforcing had done the trick in California, where many reinforced brick masonry buildings had withstood numerous severe earthquakes. National research proved to be an investment that actually saved the industry.

1950, Add Prefabrication

The war had given prefabrication its start. It is true that the houses were called demountable and were supposed to be taken down after the war to avoid ghost towns and communities, but a lot of people had bought a lot of homes pretty cheap. Thousands of these homes were now rapidly deteriorating into slum areas. They were supposed to be demounted, but nobody knew just what to do about it.

The brick industry came to the rescue with an organized campaign to "paint with brick." These jobs were done at low cost by the house mason contractors who had collectively found that they could employ bricklayers by the year. As the wartime prefabricated houses were designed to the 4-in. module, the modular brick were applied as veneer without any wasteful cutting (as in any new masonry construction). The contractors could hardly remember the old days when their profits were dissipated in unforeseen wasteful cutting and fitting.

As there were now standard sizes and details for sills and lintels, many contractors used their shops to prefabricate a supply of these for jobs to come in the spring. The masons were available; in fact, they seemed to enjoy displaying their ingenuity in making jigs and contraptions to facilitate the assembly of masonry sections. Some of them perfected workable devices that led them right into mass production. Some of the companies were trying the mortar gun for placing joints. Before they knew it, they were prefabricating reinforced porch slabs, sidewalk slabs, driveways, fireplace fronts, and panels of wall construction.

The planning and standardizing of sections was no problem at all because of the universal fit of clay products dimensioned to the 4-in. module. Delivery trucks had been equipped long ago with power cranes for handling pallets of brick. With a simple gin pole attachment, these same trucks were well suited for the loading, hauling, and placing of the prefabricated sections.

Probably the most interesting development that stimulated this activity, aside from the earthquake, was the development of string steel reinforcement. The strength of these tiny wires was almost unbelievable. They would fit into the smallest joints and would not disturb the modular spacing of the brickwork. Of course, they had to be prestressed, but that was easily done on the stretching frames, and the wires were clipped after the mortar had some initial set. There was more interest in the booklet on this type of reinforcing for masonry than anything else that had been published under the auspices of the National Reinforced Brick and Tile Board.

Not only had high-strength string steel become commercialized, but another type of reinforcement was being tested, namely, glass. Small strings of glass had even higher tensile strengths than the new steels. The contractors were anxiously awaiting reports of tests. They had long ago learned that it paid to prove new things in the laboratory and the field before springing them on the public.

1951, Add Solar Heating

The public just would not wait any longer for a house that harnessed the sun's rays to furnish its heat and hot water. The sun had supplied hot water for many years in Florida. Experiments at the Massachusetts Institute of Technology and elsewhere had finally knocked the "bugs" out of this, and the solar-heated house had arrived. It became possible, not only because of the new heat traps and insulated heat storage vats, but because the brick insulated wall with panel heating required so little heat that it worked out, even for the New England climate.

Our salesmates with the fuel companies did not care for this new development. The furnace companies had long since seen the handwriting on the wall and had merely converted their production to heat traps and vats. Most of them were already producing the panel heating units and the cavity-conditioned air circulators.

And our engineers were wondering what to plan for the next ten years!

Colonial Clays, Incorporated
311 Main Street
Worcester, Massachusetts

NOTES AND NEWS

PRESENTATION OF EDWARD ORTON, JR., MEMORIAL TABLET

Presentation Program, Ohio State University, June 13, 1942

Arthur S. Watts, Chairman,
Department of Ceramic Engineering, presiding.

(1) Introduction by Arthur S. Watts.
(2) Life and accomplishments of Edward Orton, Jr., and presentation of the Memorial by William Lloyd Evans, Emeritus Professor in Chemistry, Ohio State University.
(3) Unveiling of Memorial.
(4) Acceptance of the Memorial for the University by Harvey H. Davis, Vice-President, Ohio State University.

Introduction by Arthur S. Watts

We gather here today to complete a project that has been in progress several years.

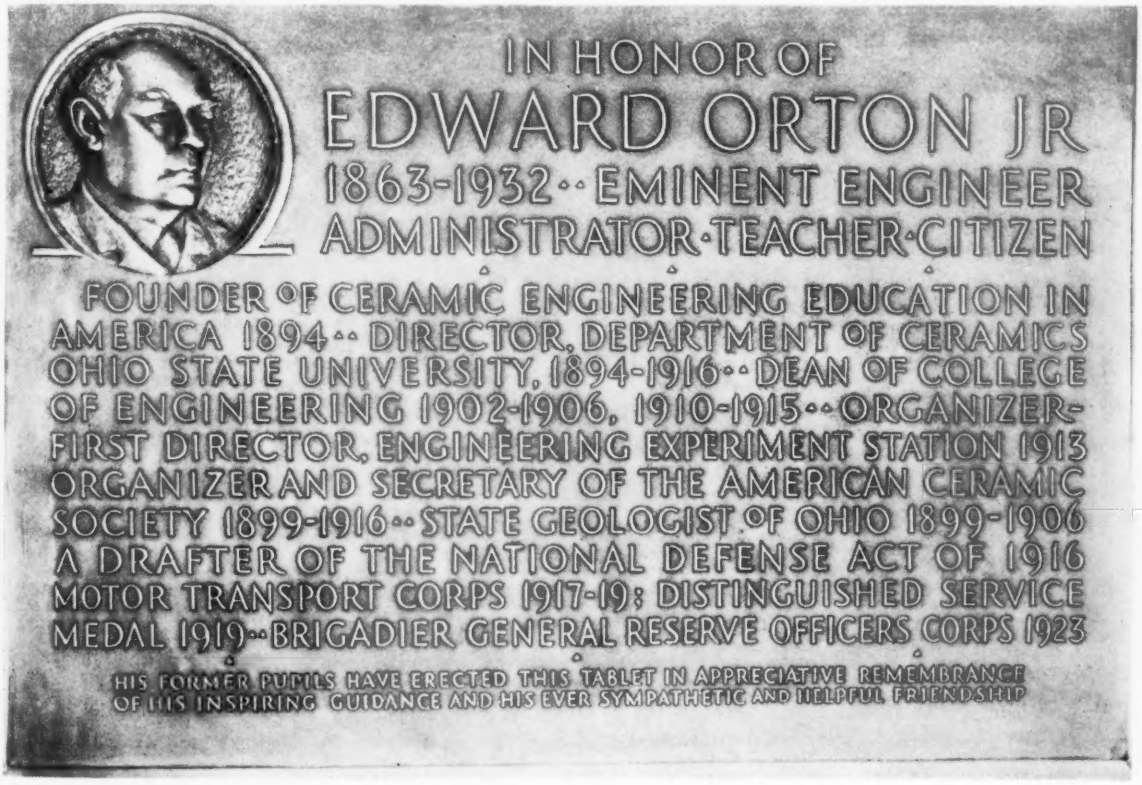
To those of us who were associated with Edward Orton, Jr., in his various activities, the lack of an appropriate memorial recounting his contributions as teacher, scientist, administrator, soldier, and citizen has been a source of profound regret.

During his lifetime, he built many monuments which will be appreciated for years to come by those who enjoy their benefits, but nowhere on this campus, to which he contributed so much, has a record of his services been erected.

About three years ago, such a project was undertaken by his former students and later was transferred to the Ohio State University Development Fund, under whose direction the necessary funds were collected.

The planning of the tablet was assigned to a committee consisting of F. C. Caldwell, Thomas E. French, and Wilbur H. Siebert of the faculty and Lawrence E. Barringer, J. L. Carruthers, Perry D. Helser, Frank H. Riddle, and Arthur S. Watts from the ceramic engineering alumni. Mrs. Orton was invited to join the Committee, and many other persons have contributed to its efforts.

The execution of the model was assigned to Erwin F.


IN HONOR OF
EDWARD ORTON JR
1863-1932 · EMINENT ENGINEER
ADMINISTRATOR · TEACHER · CITIZEN
FOUNDER OF CERAMIC ENGINEERING EDUCATION IN AMERICA 1894 · DIRECTOR, DEPARTMENT OF CERAMICS OHIO STATE UNIVERSITY, 1894-1916 · DEAN OF COLLEGE OF ENGINEERING 1902-1906, 1910-1915 · ORGANIZER-FIRST DIRECTOR, ENGINEERING EXPERIMENT STATION 1913 ORGANIZER AND SECRETARY OF THE AMERICAN CERAMIC SOCIETY 1899-1916 · STATE GEOLOGIST OF OHIO 1899-1906 A DRAFTER OF THE NATIONAL DEFENSE ACT OF 1916 MOTOR TRANSPORT CORPS 1917-19; DISTINGUISHED SERVICE MEDAL 1919 · BRIGADIER GENERAL RESERVE OFFICERS CORPS 1923
HIS FORMER PUPILS HAVE ERECTED THIS TABLET IN APPRECIATIVE REMEMBRANCE OF HIS INSPIRING GUIDANCE AND HIS EVER SYMPATHETIC AND HELPFUL FRIENDSHIP

Frey of the Fine Arts Department, assisted by Hoyt L. Sherman and Paul Bogatay of that Department.

Because we feel that Edward Orton, Jr.'s, outstanding service to the University was the founding and development of ceramic engineering and because we believe that future students in ceramic engineering should have before them his inspiring record of attainments, we have insisted that this tablet be erected here in Lord Hall.

The choice of the person best qualified to present this Memorial to the University was given careful consideration, and we are especially fortunate in having with us today William Lloyd Evans, who was chosen by Professor Orton as his first associate in the ceramic educational program. We all know of Dr. Evans' outstanding attainments as a scientist and teacher in the field of chemistry, and we are proud to acknowledge him as the teacher who, with Professor Orton, constituted the first ceramic engineering faculty. May I present William Lloyd Evans, Emeritus Professor of Chemistry, Ohio State University.

Presentation Address by William Lloyd Evans

Professor Watts, Vice-President Davis, Dean McQuigg, Mrs. Orton, Mrs. Caldwell, Mr. Fullen, alumni and faculty of the Department of Ceramics, and other friends: We are gathered here this morning to pay our respects and to do honor to the memory of Edward Orton, Jr. The work of Edward Orton, Jr., is woven into the fiber of our University, and his wisdom, his enthusiasm, and his generosity have left a deep impression upon the men who were privileged to be associated with him on this campus.

But his activities were not limited to the academic field. He responded to the needs of the community, his state, and his nation. His sympathies reveal him as a lover of humanity, sensitive to want but free from sentimentality.

His knowledge and his skills were available to and appropriated by the state. And then our nation in time of stress, similar to ours today, found in him a valued engineer and a great organizer.

It is not given to many men to have a record of so many accomplishments, each of which has had such a significant bearing in its own area. This morning, this group of friends is particularly interested in that phase of the career of Edward Orton, Jr., which had to do with the establishment of the Department of Ceramics in The Ohio State University. This is a matter of great educational importance when it is recalled that hitherto training in ceramic engineering had never been offered in any American institution of higher learning.

Edward Orton, Jr., was reared in a home in which the scientific interests of his distinguished father became the consuming interest of his son. As a student, he accompanied his father on many geological trips and thus had a most unusual opportunity to become acquainted with the materials that comprise the earth's crust and the forces of nature that alter them. In this way, he acquired an enviable knowledge of lithology and dynamic geology.

That he had thus acquired an initiative and independence for scientific inquiry is well evidenced by the fact that "in his junior year in the University, he prepared a report on the clays of Ohio, which was published in Volume V of the Reports of the Ohio Geological Survey." This interest was manifested again in his graduation thesis which bore the title, "Plans and Specifications for a Firebrick Factory." He left Ohio State University in 1884, with the degree of Engineer of Mines.

After a period of four years in the iron industry, he again turned his interest to the field of ceramics by his affiliation with several clayworking industries. Among these, he served as the superintendent of a paving-brick manufactory.

In 1893, he undertook the task of making a more comprehensive study of the clay deposits and the clayworking industries of Ohio than had been attempted previously. This research was made under the auspices of the Ohio Geological Survey. The need for such a study had arisen out of his experiences in the clayworking industry, to which reference has just been made.

The results of his field investigations appeared in Volume VII of the Ohio Geological Survey Reports. His explorations took him all over the State. This experience brought him in contact with the best ceramic workers in Ohio. In his report, he was moved to say that "in collecting information from this broad circle, I found a woeful deficiency in knowledge of the subject of clay manufacture and also that the limited literature on the subject was of very little practical value to a claymaker who was struggling with even the ordinary problems of manufacture." It seemed that the situation was one for which a remedy should be sought.

Those of us who were privileged in later years to know the workings of his mind know that the conclusion just quoted would be followed by some very definite action. He enlisted the support of both the Ohio Brick and Drain Tile Association and the National Brick Manufacturers Assocation. This larger interest in his ideas resulted in the enactment of a law by the Legislature of the State of Ohio on April 20, 1894, which authorized the Board of Trustees of The Ohio State University to establish "a department of ceramics, equipped and designed for the technical education of workers in clay, cement, and glass."

On May 26, 1894, Edward Orton, Jr., was elected the first Director of the Department of Ceramics. With reference to his qualifications for this important post, President William Henry Scott was moved to say: "He is more thoroughly versed than anyone else in the localities and the qualities of Ohio clays, and he has a practical acquaintance with clay working in several of its branches." He furthermore announced that a two-year course of study had been provisionally prepared and that the Department would be ready for the reception of students at the opening of the University in the fall.

Thus it is clear that the newly created Department of Ceramics had but one teacher at the start. Professor Edward Orton, Jr., offered the courses which were basic as well as those which dealt with the more technological aspects of ceramics. It soon became necessary to furnish him with an assistant. This was done in 1896. This added instructional unit made it possible for the Director of the Department of Ceramics to give his entire attention to the technological aspects of his work while the courses in the chemistry of ceramics were offered by his assistant.

The newly created Department was housed in Orton Hall. This fact has been appropriately memorialized by a terra-cotta plaque erected in the hallway of that building.* The laboratories of ceramic chemistry and technological operations were in the basement. In the rear of Orton Hall a small kiln was built, and it was here that the trial pieces of the students were fired. There were as many students as the facilities would accommodate. Most of them were young men who had had some experience in ceramic industries or had direct connections with some phase of the industry.

Under the inspiring leadership of Professor Orton, the students gave to the limit of their strength, dividing their time almost exclusively between the classroom and the laboratories. He never imposed a task that he himself would not willingly do. They cooperated with their leader at all times.

The students had caught the pioneering spirit of this new educational venture. In those early days, many of the present fundamental concepts and theories of physics and chemistry which now are found among the everyday tools of the well-trained student of ceramics were still unknown. In the decade in which the Department of Ceramics was founded, i.e., in the 1890's, the electron, the X ray, the rare gases of the atmosphere, and the element radium had just been discovered. The ion theory of solution was enunciated in 1886, and the first practical application of Gibbs' Phase Rule was published in 1887. The first of these events occurred only eight years, and the second one seven years, before the Department of Ceramics was founded. Yet, as it should have been, and as it always will be, the engineer, the physicist, and the chemist must

* See *Bull. Amer. Ceram. Soc.*, **20** [11] 415 (1941).

attempt the solution of their problems with the most advanced theoretical and physical equipment that are available to them in their time.

As those days of almost a half century ago may seem to have been pioneering ones, so in another fifty-year period when the centenary of the foundation of this Department will be celebrated, it may well be that the achievements of today may be looked upon then as but stepping-stones to even greater scientific and technical accomplishments.

His thorough acquaintance with the ceramic work of the State of Ohio had convinced Professor Orton that there were many important problems which were calling for immediate solution. He did not wait until his laboratories were equipped with all the apparatus which he should like to have had. His research spirit and his enthusiasm for scientific inquiry demanded an opportunity for immediate expression. These were the conditions when he began research work with whatever instrumentalities were available. Probably one of his earliest researches was the development of the "rattler test" for paving brick. At the same time, he was greatly interested in the physical examination of clays from the standpoint of their properties expressed as a function of their particle size. There were many other important ceramic problems awaiting solution by his more advanced students.

As the industry itself began to awaken to the importance of this new educational opportunity and the students of Professor Orton were beginning to take their place as scientifically trained men, the need for an exchange of views and experience became a pressing one. Out of this situation Professor Orton founded The American Ceramic Society, Inc., one of our splendid scientific groups in America. Its *Journal of The American Ceramic Society* affords the scientists in this field an opportunity to make known the results of their research endeavor, both basic and technical.

The founder of the Department of Ceramics of the Ohio State University had a vision with reference to ceramic education. His dreams concerning a sound scientific basis for this important subject have come true. When he was called to still other problems in the greater development of the University, he passed on the torch to those whom he deemed worthy to carry it in the years ahead. This they are doing in their position of leadership in ceramic education in America.

To them he gave the luminous flame that they will keep and share with many of his spiritual sons. When all things that now seem imperishable shall have passed away, there will still remain the spirit of that great soul, Edward Orton, Jr.

Vice-President Davis, it now becomes my very pleasant duty to present to The Ohio State University on behalf of of the alumni of the Department of Ceramics in cooperation with the Development Fund, the beautiful bronze tablet commemorating the life and work of Edward Orton, Jr.

EDWARD BAUSCH BUILT A MUSEUM

A museum which grew from an ox yoke and a Benares silver tea set housed in a boys' reformatory celebrated its twenty-seven years of growth on May 23 by moving into a new $521,000 building on Rochester's proudest thoroughfare, elm-shaded East Avenue.

Scholars and savants from far and wide thronged the new Bausch Hall of Science and History to share in the dedication of the new building given by Edward Bausch, scientist and industrialist, to the people of Rochester.*

Prevented by illness from participating in the ceremonies, Dr. Bausch was represented by Herbert Eisenhart, president of the Bausch & Lomb Optical Company, who presented the building to Mayor Samuel B. Dicker, the city's representative, in the presence of a notable gathering of celebrities, among whom were Vilhjalmur Stefansson, who delivered the dedicatory address, and Alfred Noyes, distinguished English poet, who had addressed the convocation on the preceding day.

The new building of Indiana limestone consists of three main floors, a mezzanine, and a large basement. On the roof is a capacious penthouse which houses the heating and air-conditioning plant. Air is drawn from the outside, warmed, washed, and the dust eliminated. Large blowers force the air through ducts in the ceilings of each floor. The entire atmospheric contents of the building (1,110,000 cubic feet) can be changed in five minutes.

In addition to the main halls and exhibit rooms, the building contains a research laboratory, reception hall, auditorium, photographic studio, darkrooms, a room for recording and radio work, a star garden for astronomical work, craft rooms, workshops, design shops, a large kitchen, print shop, and a number of meeting rooms.

Dr. Bausch included in his gift his home and the beautiful grounds surrounding it. This building will eventually be used as a Children's Museum with classrooms and exhibit halls to take care of this important and growing phase of the museum's activities.

Asked why he thought of building a museum, Dr. Bausch said: "In looking back, I find that as a boy of about fourteen I made a visit to Anderson Hall on the original campus of the University of Rochester. On the top floor, as I remember, was Professor Ward's museum. I visited it a number of times and was deeply interested in what it contained. Who can explain the yearnings in the mind of a boy with regard to things of which he knows nothing and about which he wants to know?

"I am extremely happy in the thought that it has been my good fortune to be spared long enough and to be fortunate enough to have acquired sufficient means to carry out a plan which for years was only a dream. It is my hope that this museum will continue to be a source of enlightenment and pleasure for generations to come."

A bronze bust of Dr. Bausch, a gift of the Bausch & Lomb employees, was unveiled by a committee representing these workers during the dedication ceremonies.

* For life story of Edward Bausch, see *Bull. Amer. Ceram. Soc.*, **20** [2] 57 (1941).

FIBERGLAS DECORATIVE FABRICS

Fiberglas decorative fabrics such as those shown in the accompanying photograph have also been used in restaurants and hotels in Houston, Washington, and New York.

Curtains of lustrous white Fiberglas in Victorian Room of Hillcrest Hotel, Toledo, Ohio.

CHARLES DOUGAN TO TEACH AT MISSOURI SCHOOL OF MINES AND METALLURGY

Charles W. Dougan will begin teaching in the Department of Ceramic Engineering at the Missouri School of Mines and Metallurgy, Rolla, Mo., next autumn. This summer he will be employed by the Missouri State Geological Survey, where he will do research work on clays.

Mr. Dougan attended the University of Alabama, where he obtained his Bachelor of Science degree in 1938, and the Montana School of Mines, where he received the degree of Master of Science in Ceramics in 1939.

He is a member of The American Ceramic Society, the American Institute of Mining and Metallurgical Engineers, and Sigma Rho, a mining fraternity of the Montana School of Mines.

Before becoming associated with the Missouri School of Mines and Metallurgy, Mr. Dougan was successively employed by the American Rolling Mill Co., Middletown, Ohio; the Puget Sound Power Co., Seattle, Wash.; the Montana State Bureau of Mines, Butte, Mont.; and the Gladding, McBean & Co., Glendale, Calif.

CHARLES FERGUS BINNS MEDAL TO HAROLD S. NASH

Harold S. Nash, professor of ceramics at the University of Cincinnati, Cincinnati, Ohio, and an alumnus of the New York State College of Ceramics, Alfred, N. Y., is the recipient of the Charles Fergus Binns Medal for 1942.

Given each year to the most distinguished ceramic artist in America who has not previously received it, the Medal is awarded by a jury consisting of representatives of the National Terra Cotta Society, the United States Potters Association, the Ceramic Guild of Alfred University, and The American Ceramic Society, Inc.

This Medal is awarded not only in recognition of distinguished achievements in ceramic art but as a reverent tribute to the memory of a great man. In that tribute all people of Alfred University join both individually and collectively.

CLAY PAPERS PUBLISHED

The *Journal of Geology* for May, 1942, contains the following papers which were presented during the Symposium on Clay: Frontier Researches on the Structure, Properties, and Occurrence of Clay Materials and Their Practical Application, which was held under the leadership of Ralph E. Grim at the Fiftieth Anniversary Celebration of the University of Chicago on September 25 and 26, 1941:

(1) "Modern Concepts of Clay Materials" by RALPH E. GRIM, Illinois Geological Survey, Urbana, Ill.

(2) "Relation of the Lattice Structure of Clay Minerals to Some Properties of Clays" by STERLING B. HENDRICKS, Bureau of Plant Industry, U. S. Department of Agriculture.

(3) "Applications of Modern Clay Researches in Agriculture" by WALTER P. KELLEY, College of Agriculture, Univ. of California, Berkeley, Calif.

(4) "Applications of Modern Clay Researches in Ceramics" by F. H. NORTON, Dept. of Physics, Massachusetts Institute of Technology, Cambridge, Mass.

(5) "Applications of Modern Clay Researches in Construction Engineering" by HANS F. WINTERKORN, College of Engineering, Univ. of Missouri, Columbia, Mo.

Copies of this Journal may be obtained from the University of Chicago Press, 5750 Ellis Ave., Chicago, Ill. The price for a single copy is $1.00.

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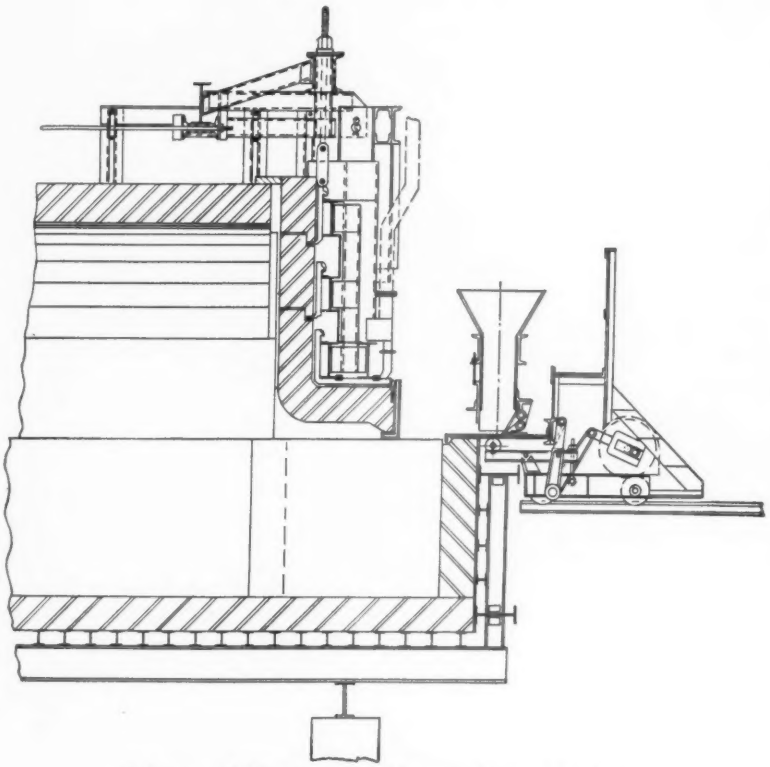

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United Clay Mines Corp.

Clay-Slip (Albany)
Hammill & Gillespie, Inc.
United Clay Mines Corp.

Clay (Wad)
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Clay (Wall Tile)
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
United Clay Mines Corp.

Cleaners
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

Clocks (Gauge Board)
The Hommel, O., Co., Inc.

Cobalt Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cobalt Sulphate
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Colors
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. &. H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cone Plaques
Industrial Ceramic Products, Inc.

Cones
The Edward Orton, Jr., Ceramic Foundation

Conveying Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
National Engineering Co.

Copper Oxide
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Corhart
Corhart Refractories Co.

Cornwall Stone (Imported)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Paper Makers Importing Co.

Crucibles (Filter, Melting, Ignition)
Carborundum Co.
Denver Fire Clay Co.
Norton Co.
Potters Supply Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Industrial Ceramic Products, Inc.

Decorating Supplies
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Disintegrators
Lancaster Iron Works, Inc.
National Engineering Co.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Drying Machinery
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
Proctor & Schwartz, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enamelers' Borax
Porcelain Enamel and Mfg. Co.

Enameling Equipment (Complete)
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The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

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The Hommel, O., Co., Inc.
Lancaster Iron Works, Inc.
Norton Co.

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Enameling Muffles
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Norton Co. (*Alundum*)

Enameling (Practical Service)
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Enamels
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Enamels (Porcelain)
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Equipment (Porcelain Enameling)
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Feldspar
Du Pont de Nemours, E. I., & Co., Inc. R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Paper Makers Importing Co.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Filter Fabrics
Metakloth Company

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Denver Fire Clay Co.
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Flint
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Paper Makers Importing Co.
Porcelain Enamel and Mfg. Co.

Flint Pebbles
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

French Flint
Maxson, Elwyn L.
Paper Makers Importing Co.

Frit
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.

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Frazier-Simplex, Inc.

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Denver Fire Clay Co.
Frazier-Simplex, Inc.
The Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Furnaces, Enameling
Swindell-Dressler Corp.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment
Lancaster Iron Works, Inc.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Paper Makers Importing Co.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Glazes and Enamels
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Glaze Spar
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
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	Alkalis (Na_2O, K_2O)	0.00
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The Vitro Mfg. Co.

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Norton Co. (*Alundum-Crystolon*)

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Corhart Refractories Co.
Norton Co. (*Crystolon*)

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Norton Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.

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Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.

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Foote Mineral Co.
Harshaw Chemical Co.
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Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Kaolin
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Thomas Alabama Kaolin Co.
United Clay Mines Corp.
The Vitro Mfg. Co.

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Frazier-Simplex, Inc.
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Swindell-Dressler Corp.

Kilns (Electric, Circular, Tunnel)
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Electro Refractories & Alloys Corp.
Louthan Mfg. Co.

Kryolith (see Cryolite)
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Laboratory Ware
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Electro Refractories & Alloys Corp.

Lehrs
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Lehr Loaders
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Electro Refractories & Alloys Corp.
Norton Co.
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Lithium Minerals
Foote Mineral Co.

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Norton Co.

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Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

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Nitre
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Lancaster Iron Works, Inc.

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Electro Refractories & Alloys Corp.

Refractories
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Corhart Refractories Co.
Denver Fire Clay Co
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.

Refractory Materials
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Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Norton Co.
Thomas Alabama Kaolin Co.
Titanium Alloy & Mfg. Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Saggers
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Electro Refractories & Alloys Corp.
Norton Co.
Potters Supply Co.

Salt Cake
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

Sand Grinder and Sifters
Lancaster Iron Works, Inc.

Saponin
The Hommel, O., Co., Inc.

Screening and Magnetic Separators
National Engineering Co.

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Drakenfeld, B. F., & Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

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Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Setters (Tableware)
Louthan Mfg. Co.

Sheets (Enameling Iron)
American Rolling Mill Co.

Silica (Fused)
Electro Refractories & Alloys Corp.
Foote Mineral Co.
The Hommel, O., Co., Inc.

Silicate of Soda
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Silicon Carbide Firesand
Carborundum Co.

Sillimanite Refractories
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.

Slabs (Furnace)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Soda Ash
American Potash & Chemical Corp.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
The Vitro Mfg. Co.

Sodium Antimonate
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Sodium Fluoride
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Sodium Metasilicate
Harshaw Chemical Co.

Sodium Nitrite
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Sodium Silica Fluoride
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Sodium Uranate
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Soot Blowers
Frazier-Simplex, Inc.

Special Machines
Frazier-Simplex, Inc.

Spar
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Spray Booths
The Hommel, O., Co., Inc.

Spraying Equipment
The Hommel, O., Co., Inc.

Spurs
Louthan Mfg. Co.
Potters Supply Co.

Stacks
Lancaster Iron Works, Inc.

Steel Plate Construction
Lancaster Iron Works, Inc.

Stilts
The Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Louthan Mfg. Co.
Potters Supply Co.

Sulfur
Stauffer Chemical Co.

Sulfuric Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Talc
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
International Pulp Company
Paper Makers Importing Co.

Tanks
Frazier-Simplex, Inc.

Tank Blocks
Corhart Refractories Co.

Tanks (Pickle)
The Hommel, O., Co., Inc.

Tanks for Raw Material Steel or Concrete
Lancaster Iron Works, Inc.

Tile (Floor)
Norton Co.

Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile Setter Pins
Louthan Mfg. Co.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.
Thomas Alabama Kaolin Co.

Tile (Wall)
Denver Fire Clay Co.
Thomas Alabama Kaolin Co.

Tin Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Drakenfeld, B. F., & Co.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Trisodium Phosphate
Harshaw Chemical Co.

Trucks
Lancaster Iron Works, Inc.

Tubes (Insulating)
Carborundum Co.
Louthan Mfg. Co.
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
Carborundum Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.
Norton Co.

Uranium Oxide
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Uranium Oxide (Yellow-Orange-Black)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Water Softening Plants
Frazier-Simplex, Inc.

Wet Enamel
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Whiting
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Paper Makers Importing Co.
The Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Zircon
Foote Mineral Co.
The Hommel, O., Co., Inc.

Zirconia
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Zirconium Oxide
Foote Mineral Co.
The Hommel, O., Co., Inc.
Titanium Alloy Mfg. Co.

Zirkite (Natural ZrO_2)
Foote Mineral Co.

A DECLARATION of INDEPENDENCE for the Ceramic Industry
THE PROBLEMS faced today by the ceramic industry aren't easy ones. But they offer a new opportunity for the industry to declare its independence of old materials and methods.
Some types of colors are no longer available. Others may be restricted in use. Colorful domestic decalcomanias are coming into their own. In this field a new development by du Pont gives promise of bringing to America higher standing in the art of decalcomania decoration than has ever been achieved abroad.
Today, America has more colorful glassware. Many beverage containers now have vitrified labels which stand up under severe usage. Even more important, the use of fired-in labels saves re-labeling and materials, helpful measures in the nation's conservation program.
Du Pont is keenly aware of the problems faced by the ceramic industry today, and is working hard to find reasonable substitutes for unavailable materials. Call for the assistance of Ceramic Service whenever you have a color or decoration problem.
DU PONT
E. I. DU PONT DE NEMOURS & COMPANY, (INC.)
ELECTROCHEMICALS DEPT. CERAMIC PRODUCTS DIVISION
WILMINGTON, DELAWARE

Advertise in the Bulletin

Number of Insertions

	1 month	*3 months*	*6 months*	*12 months*
Full page	**$66.00**	**$60.00**	**$52.00**	**$44.00**
Half page	**35.00**	**33.00**	**30.00**	**26.00**
Quarter page	**20.00**	**18.00**	**16.50**	**15.00**
Eighth page	**10.75**	**9.90**	**9.00**	**8.25**

Classified advertisements: 35 words for $1.10 per insertion

Cover positions: list plus 25%

First page preceding or following reading matter: list plus 20%

Color rates: on application

Reading notices not accepted

THE OFFICIAL SOCIETY KEY

The Society Key is an attractive piece of jewelry in yellow gold with blue enamel. The size of the key is about 1¼ inches by ¾ of an inch.

The key is available with the inscriptions of "Member," "Fellow," or "Student."

The price of the gold-filled key is $3.60 and the solid gold key may be purchased for $7.15. (Prices include Federal Tax.)

ADDRESS ALL ORDERS TO THE

AMERICAN CERAMIC SOCIETY
2525 N. HIGH ST. COLUMBUS, OHIO

Be Calm Courteous Effective

Right now, when times are tense and everybody is under strain, "The Voice with a Smile" is more important than ever.

We've all got a big job to do and the friendly, effective use of the telephone helps every one do it faster and better.

The calm way is usually the competent way. Being courteous usually means saving time and tempers all along the line.

BELL TELEPHONE SYSTEM

"THE TELEPHONE HOUR"— *presenting great artists every Monday evening — N. B. C. Red Network.*

H. C. SPINKS CLAY COMPANY

Miners and Shippers of

BALL, SAGGER AND WAD CLAY

NEWPORT, KY.

Puryear, Tennessee
July 1, 1942

Mr. Peter Potter
Comfortable Sanitary Pottery Mfg. Co.
Pottsville, U. S. A.

Dear Pete:

Things are in a mess down here. We have sold all our old rubber and now you can't find an old tire to put on the dragline boom to keep the cable from rubbing it.

Last week we sent all our old machinery to the bullet factory. Honestly, when something breaks you can hardly find a piece of haywire. It seemed funny to be working hard tearing up the old steamshovel when for years we worked so hard to keep it together. I got a real kick out of putting the old horse-drawn wheeled scrapers in the car. They nearly killed us all when we used them, surely they will make bullets that won't miss.

Speaking of the old wheelers and the rubber tires—we have a buggy, some wagons and 25 horses, so send down the orders—we'll keep the clay rolling!

Sincerely,

Dick Carothers

General Manager
H. C. SPINKS CLAY COMPANY

SCRUB-

SCRUB-

CHILD AND TUB

IT'S amazing to see what one small child can do to the clean surface of a bath tub. And if there happen to be several youngsters in the family, efforts to keep the surface in its original gleaming condition constitute a real test of the enamel finish. ● At the M & T Ceramic Laboratory our technicians are constantly working with manufacturers of enamels and glazes to help them produce finishes that will stand up under hard daily usage. ● Careful laboratory control in the manufacture of Metal & Thermit Tin Oxide and Sodium Antimonate assures a high degree of opacity and a brilliant *lasting* finish, whether color or white.

We cordially invite inquiries from manufacturers on any phase of production of porcelain enamels and glazes.

TIN OXIDE

SODIUM ANTIMONATE

METAL & THERMIT CORPORATION

120 BROADWAY • NEW YORK, N. Y.